GAS JOURNAL, JAN. 15, 1947

VOL. 249 99th YEAR No. 4365

CAREERS IN THE GAS INDUSTRY

NEVER in the long history of the Gas Industry has it been more necessary to strive for increased efficiency in manufacture, distribution, and utilization, the intake of new men (and women) with suitable qualifications and ability, and the improvement of working conditions and welfare than at present. So great is the progress that the Industry is at present experiencing that, as Colonel C. M. Croft said in his Presidential Address to the Institution of Gas Engineers last June, there is an almost limitless opportunity for fresh blood in the way of entrants. For years the Institution has sought to attract into the Industry the class of youths who, by character, physical condition, and mental attainments are likely to prove valuable as future managers and leaders, and the Careers' Committee has for some considerable time been concentrating on the preparation of a book dealing with the openings and prospects which the Industry offers to young entrants.

"Careers in the Gas Industry" has now been officially released for distribution, and the Careers' Committee is to be complimented on its presentation. Complimentary copies are being widely distributed, and it is hoped that the book will bear fruitful results and attract keen recruits to the Industry. It sets out to answer some of the questions that those who are at an age at which they have to make up their minds what to do in life will naturally ask. It tells, quite briefly and to a large extent pictorially, how gas is made, how it is sent to those who use it, what it is used for, what sort of work is done by those in the Industry, and how to rise to good positions. A diagram indicates how laboratory assistants, apprentice engineers, gas fitters, and clerks, recruited from secondary, technical, and public schools and receiving salaries of from £150 to £350 at 21, may rise, with the assistance of more advanced education and their own diligence, to the higher executive positions carrying salaries of £1,500 and upwards. One important point made in the introduction is that there are many posts open to those who are interested in commerce, finance, engineering, and science, and all who feel drawn to the Industry are urged, as a first step, even while still at school, to get their headmaster or careers' master (or mistress in the case of girls) to write to the Secretary of the Institution.

The opportunities for rising in position and salary are considerable, but there are no short cuts to the chief executive's office. Everything depends on the individual. Is he prepared to work hard? Is he alert and willing? Is he interested in his work? Has he the ability to hold a better post, involving more individual responsibility and higher qualifications in knowledge and experience? Does he get on with his fellows? Is he a "sportsman" in the best sense of the term? If the answers to these questions are the right ones, his feet are set on a ladder by which the junior can rise to a senior, the senior to a chief, to management, and to the highest administrative posts. Some selected examples in the last chapter show how just a few of those now in the Industry have advanced and are still advancing.

There are three recognized methods of entering the engineering side of the Industry for the young man who has the education and ability to aspire to the higher posts: (1) By first taking a university degree in science, engineering, chemical engineering, or gas engineering; (2) by becoming, on leaving school or after passing through the university, the pupil of a gas engineer of standing; and (3) by entering from school as a junior in the drawing office or laboratory, or in some other junior position. Whichever of these methods is adopted, there are two courses open to the entrant; to join the staff of a gas supply undertaking, or one of the firms supplying the Industry with plant, equipment, or appliances. Detailed advice is given to those who contemplate entering the Industry as scientists, for whom there are likely to be unique opportunities in the next ten or 20 years.

Those with a leaning towards the commercial side are reminded that there are three lines of approach to administration: (1) By direct training for the post; (2) by promotion from the executive staff (which has been the most usual in the Gas Industry, where the duties of engineers and managers have commonly been combined in the smaller and moderate-sized undertakings); and (3) by promotion from the administrative staff. A reasonable standard of education is required, no matter which line is taken. Openings in contracting firms are also discussed in some detail, intending entrants being advised to apply for further particulars to the Society of British Gas Industries.

A chapter on technical education in the Gas Industry sets out the qualifications necessary for the various grades of membership of the Institution of Gas Engineers, and deals under sectional headings with university education, and the question of entry to the Gas Industry direct from school, all of which should be extremely helpful to those who feel called to devote their lives to the Industry. It will come as a surprise to many outside the Industry to learn of the careers it offers for women, who first entered in Industry in considerable numbers during the 1914-18 war. There are few industries offering a wider range of suitable work. In the main, the chapter on careers for women deals with the laboratory, the accounts department, industrial art as applied to the installation of appliances and the arrangement of showrooms and exhibitions, the drawing office, the general clerical staff. cookery demonstrators, showroom staff, home service advisers, and social welfare work. The higher the standard of education the better the opportunity, though there are in most cases facilities for further training for those who have the will to succeed.

In a foreword, Colonel Croft points out that there is practically no branch of engineering, chemistry, physics,

accountancy, and other allied professions in which positions are not only available in the Gas Industry, but waiting for the right class of entrant. While those who aspire to the higher administrative and technical positions must primarily have a good general education and then apply themselves to training, there are many opportunities for those who, while being intelligent and keen, have not been able or had the opportunity to gain academic qualifications. Finally, he hopes the book will prompt those considering a career in the Gas Industry to make further enquiries "so that we may be sure of leaving the control of our enormous and important Industry in competent hands."

MAJOR FUEL CRISIS

SHOULD there be an overall breakdown in the supply of gas the critical effect on the life of the community cannot be over-emphasized. Elsewhere in this issue we publish an article by Mr. J. R. W. Alexander, General Manager of the British Gas Council, in which he surveys the present serious fuel situation. We imagine that no one in the Gas Industry is unaware of the difficulties and dangers to which Mr. Alexander refers, but we are not so sure that the individual undertakings have yet, in every case, taken their consumers sufficiently into their confidence to inform them of the situation and to enlist their co-operation in whatever measures of economy may be possible in the circumstances. The British Gas Council is constantly receiving enquiries from member undertakings and from the general Press arising out of various aspects of the gas coal and plant shortage and the effects of reduced gas pressures and breakdowns. It was with the object of answering such enquiries and summarizing the position that Mr. Alexander wrote his article.

We give it as much prominence as possible, not because it contains much more information than is already common knowledge *within* the Industry, but because it seems to us to provide those whose duties bring them into contact with the consumer with a complete statement of the Industry's difficulties in these critical days. It is by no means a cheerful message, but its frankness should commend it to those whose implicit reliance on an unfailing gas supply is in danger of being disappointed. It shows that the Industry is doing its best in adverse circumstances, and dissemination of the information among all classes of consumer—domestic, industrial, and commercial—cannot fail to enhance the prestige of the Industry.

STAND-BY PLANT

IN a Paper to the Auxiliary Section North of England Gas Managers' Association—published in the "JOURNAL" last week, Mr. S. G. Irwin discussed several methods of meeting sudden increased demands for gas. The choice of stand-by plant will be dependent upon a number of factors—the relative magnitude of the peak load and its incidence, the type of carbonizing plant normally in use, the relative values of coal, coke and oil, and so on. We have the advantage, of course, over the electrical industry that storage enables us to take care of hourly peaks. Seasonal peaks can be taken care of by true stand-by plant—that is, plant in excess of average requirements. Such plant must be sufficient to cover the necessities for repairs which are normally undertaken in the annual period of minimum demand, bearing in mind that this period must be long enough to allow for resetting retorts. Three months would be the minimum period in normal times, but shortage of materials and labour has necessitated as much as six months, and sometimes more, in recent years. The weekly peak is more troublesome. It must generally be met either by settings standing always under heat, coming in and out of operation every week, or by water-gas. If the peak is not too pronounced the continuous vertical retort will deal with it. There remains the more difficult problem of unforeseen and sudden demand such as may result from unusual weather conditions.

When the carbonizing plant in horizontal retorts, or some other intermittent system, operating at a relative high calorific value, there appears to be no alternative to the carburetted water-gas plant. It has all the advantages claimed by Mr. Irwin, and of the disadvantages we suggest that in view of the urgency of the type of situation in question some of these are negligible. Certainly we need not bother about the "increased toxicity. . . . . due to the higher carbon monoxide content." The difficulties in maintaining the required calorific value will be less in cases where the declared value is well below 500 B.Th.U. per cu.ft. because in such cases, presumably, the water-gas plant must always be in use.

The maintenance of retort settings under heat, at any rate for long periods, has all the disadvantages set out by Mr. Irwin. Increasing output from existing plant, bearing in mind that this is to be done without lowering the calorific value of the gas distributed, is difficult, if not impossible, with horizontal retorts and most, if not all, other intermittent systems. It can be done by reducing benzole recovery combined with an extension of the carbonizing period. But "the increase in output is limited and may not be sufficient to meet the heavier peak loads."

The possibilities of the continuous vertical have not yet been fully explored. Instances have been reported where gas production in the same number of retorts has been varied to the extent of 50% of the maximum within a matter of hours. It this could be done generally it would meet most of the peaks. But can it? That is the question which should be investigated. No doubt the answer will be conditioned largely by the physical and chemical properties of the coal under treatment. All operators know that some coal can be made to travel through the retort at widely varying speeds, whereas others, described as "difficult coals," will work easily only over a very limited range of speed. But given a reasonably "easy" coal it appears that there would be no difficulty in operating a continuous vertical plant at a rate somewhat below the minimum for the optimum efficiency and then "boosting it up" as required to meet a peak load. One would think that the range over which this could be done would be generally sufficient to cover at any rate the weekly peak. If this were so most peaks would be covered without the necessity for keeping settings idling under heat and without the deleterious effect on the life of the refractories due to alterations in temperature over a wide range, and the thermal efficiency of the process is probably not seriously affected. These possibilities are among those we have already suggested for investigation by the Gas Research Board.

When Mr. Irwin turned to future developments to meet the secular increased demand for gas over the Industry as a whole, he was in deeper waters. Apart from new methods not yet available, obviously you can make more gas per ton of coal by reducing the calorific value of the gas made but not without sacrificing some of the coke. Equally obviously this is the only way in which gas production can be increased without a proportionate increase in the quantity of coal used. Looking then only to the more immediate future and in view of the present shortage of coal, more gas could be made from the same quantity of coal by an all-round reduction in calorific value in those cases where suitable plant is available. Troubles with distribution there might be, but at most these would not generally amount to more than a reduction in pressure, to which some districts are already unfortunately inured. In many cases there would be no

trouble at all except a small increase in the cost of production, and that only in very few cases.

COAL CONSERVATION ON GAS-WORKS

AT the same meeting of the Association, Mr. D. B. Laws discussed methods by which coal can be saved immediately in the way of ordinary works and routine. His Paper is published in our issue to-day. He began with the carburetted water-gas plant and turned down the proposal to drive the blower by electricity. And with good reason, since "where a small mechanically operated plant is working with little supervision the unobserved stopping of an electrically driven blower might have serious consequences." The recommendation to equip carburetted water-gas plant with a waste-heat boiler will meet with no objection. The size of the relief holder has not much bearing on fuel economy but it would have been interesting to have Mr. Laws' definite figure for this. There appears to be no recognized rule, and practice varies widely. The recovery of coke from producer cleanings has an obvious bearing on coal conservation, but it was not so obvious, though sufficiently startling, that considerable loss of gas may occur in horizontal retorts as a result of coke quenching injuring retort mouthpieces and even the ends of the retorts themselves. Cyanogen recovery may no doubt be advantageous. The Williams process, we are told, requires completely tar-free gas, which is itself a necessity of good, dry purification. But its relevance to the subject is not apparent. Smoke abatement, on the other hand, is decidedly relevant, and Mr. Laws made suggestions which ought to attract more attention than it is to be feared they will. There must indeed be many cases, besides small shunting locomotives and river craft, where coal could be replaced by the smokeless coke. The most amazing is that of the boiler plants in connexion with hospitals and sanatoria, which quite unnecessarily contribute to the smoke nuisance. Whether we shall ever persuade the miners to use gas and coke instead of their "free coal" is, to say the least, doubtful. But it is to be noted that in Durham County alone in 1945 no less than "882,000 tons of coal were distributed to colliery workers and 559,000 tons used at and around the mines."

HOME FIRE

OF all the ways of ascertaining public opinion on such a subject as domestic heating, probably the best is to attend carefully to what is said by a great leader of opinion on those rare occasions when he brings his full powers to bear upon so comparatively humble a subject. In a recent issue the Editor of *The Observer* devoted his leading article to a general survey of domestic space heating. He began with a sharp criticism of "the strange policy which promoted an increased use of electricity when it must have been known that supply could not keep pace." It is to be inferred that the "electricity cuts" have brought the seriousness of the coal situation most impressively home to the urban intelligentsia. Nemesis has overtaken the electrician. He promoted electric cooking and space and water heating in order to level out his load. In fact he has merely accentuated his peaks. And now he is reduced to asking his domestic consumers to cook in the afternoon or evening.

After remarking on the announcement that the Central Electricity Board does not hope to catch up with the demand until 1950 (with a wistful look at the prospect of the "manageable atomic pile") the writer gets down to a discussion of space heating proper. And it is something if the general public has moved so far as to realize that the open fire is not doing the job. But it is to be given up with great reluctance. "There are *only two things wrong* (our italics) with open fires," we are told; "they pour a lot of smoke into the atmosphere, and they are very inefficient as a way of warming houses." But that only gives "the open fire a bad name by making it do unsuitable work." And what work would be suitable? "One health-giving merit of the open fire is that its output of heat varies rhythmically as it burns up, turns to a steady glow, and is cooled by stoking." Then we have the almost usual paragraphs about the "cherished traditions" &c. "Any criticism of it arouses passionate defence, almost as though the sanctity of the home were being attacked."

Still, while there is no attempt to reflect on the rather wonderful fact that all the rest of the world gets on very well without this bulwark of the sanctity of the home, there is an attempted solution of the problem. The suggestion is that the temperature all over the house should be raised to a moderate level—presumably for this purpose there would be toleration even of "the enervating modern hot water pipes, coiling their foreign luxury round the domestic scene"—and that the open fire should be reserved "for giving a pleasant touch of extra warmth and brightness to the rooms chiefly used." "The alliance of gently warmed air and flickering flame is the ideal we ought to keep in view."

Finally, we are reminded of "our ancestors long ago," burning the Yule log in the cold, dark winter, crouching round their fires "in the threatening forest"; and so we must imitate them for ever—even if we do abuse the open fire by asking it "to do the work of a furnace and grumbling when it fails."

It is to be noted that there is very little emphasis on efficiency in coal economy in all this. There is no realization of the fact that the Englishman "shivers on the stairs" (not to mention in the bed-room) when his American cousin is comfortably warm all over the house, and that for no more expenditure of fuel. The melancholy fact is that even our leaders of opinion are very far from apprehending the position as put by Mr. Lyle: "Posterity will never forgive us if we continue to waste 85% of our coal."

But there is a lesson to be learnt from *The Observer*. The intelligent public is evidently nearly ready to accept a combination of moderately warmed air throughout the house with some form of local occasional radiant heating. We may forget the claim for "rhythm" if we can produce, and maintain, a gas fire of good appearance and silent in operation which can be readily ignited as desired. And this we can surely do. Our cookers easily hold their own. Ally these with an effective gas-fired system of combined hot-water circulation for space-heating and hot-water supply for washing, &c., and this at a reasonable price, and the all-gas house will solve all the problems. Whether it will ever win a place in the poetry books is open to question.

BLACK MAGIC

THIS is reputed to be an enlightened age, an age of fresh truths and banished misconceptions. Each successive year, we are told to believe, sweeps away a further cobweb of ignorance and superstition. How strange then that to-day, facing a fuel crisis which has never been equalled in our history, the means to alleviate that crisis are viewed with the distrust and misunderstanding of a Zulu who refuses to discard black magic for white medicine. Black magic—the lure of the coal in which, so they say, men see visions and dream dreams. There can be little doubt that the easy availability of coal for many years has become so rooted in the public mind that it cannot now be accepted as a valuable and even precious mineral. The arguments, pleas, and positive proof of those hoping to convince the average man of the appalling waste of the open grate coal fire and

the horror of smoke pollution have fallen upon politely deaf ears.

The British climate is capricious to a degree; British winters have a damp cold unknown in most parts of the world. One would imagine, therefore, that in this country would be found the most progressive forms of house construction and heating. This is not so; our fronts scorch, our backs freeze.

The peculiar superstitions attaching to the usage of gas for room heating—the familiar "fumes" from gas appliances, the need to place a bowl of water before a gas fire, and so on—have existed for many years and still persist, appearing with depressing regularity in conversation and even in print. It was to explode some of these fallacies that Mr. Frank Brinsley, of Radiation, Ltd., addressed an audience of editors on Thursday last. Speaking of radiant heating from the viewpoint of health, he explained the medically accepted fact that such heating has the effect of stimulating the body, while variation in temperature in different parts of the house maintains the comfort regulating mechanisms of the body in an active condition. It is unnecessary to stress the delay resulting from an attempt to raise room temperature from perhaps 35° to 56°F. by the normal sources of radiant heat employed in this country. It was from a realization of this expensive inconvenience that the modern conception of house heating—the house being maintained at about 50°F. by convected heat and supplemented by a radiant heat source—was formed. This method, reinforced by efficient house insulation, has been amply demonstrated in recently erected demonstration houses.

The fire or stove has always been the focal point of family life and it is interesting to learn that the Americans, who renounced such a method in favour of heating by convection alone, have felt the loss to such an extent that in the wealthier homes a fireplace is provided. Although this is primarily for aesthetic reasons, there is a growing body of opinion which supports our own view that moderate convection heating with supplementary radiation from a incandescent source is the ideal system.

There is need for a campaign to acquaint the public with the elementary facts of efficient heating and this can be done through the Press, although we feel that individual undertakings can do much to circularize and educate their customers, both actual and prospective. Man must be converted from the primitive lure of black magic to the greater benefits of science. It is to be hoped that Mr. Brinsley, in the guise of a missionary, may see his doctrine bear fruit.

About Domestic Help

An exciting new development in raising the status of domestic work is the formation of a National Institute of Houseworkers, as recommended in the Markham-Hancock Report on private domestic employment. The Women's Gas Council is mentioned here because of the appointment of Mrs. Abbott as the W.G.C. representative on the Advisory Council, at the invitation of the Ministry of Labour. This Council has been formed under the Chairmanship of Miss Violet Markham and represents the various interests concerned in the domestic field. The first and most important aim of the Institute is to raise the prestige of domestic employment and to attract more workers into this profession. It will also serve as a centre of research for all problems relating to the supply of the demand for workers in private domestic employment. A large house in Mount Street, W.1, has been acquired as headquarters, and here girls wishing to take up a domestic career will be given six months' general training in the many aspects of housecraft, with a further opportunity of specialization if desired. The course will be Government-sponsored and without cost to the trainees. The Women's Gas Council is to be commended for once again being well to the fore in the latest developments to benefit the homes of the future.

Hydrogen Sulphide Removal

In our editorial columns last week we dealt at length with the various methods of liquid purification of gas for the removal of sulphuretted hydrogen. On p. 87 we commented on the Thylox process. We should like it to be noted that the word "expensive" should read "extensive." This is important to the general context of the editorial in question.

Letter to the Editor

Triple Process of Gas Manufacture

DEAR SIR,—Referring to the letter in your issue of Jan. 1 from Mr. Scott, of Canterbury, we wish to point out that the triple gas process in chamber ovens is covered by British Patent No. 497149, of which thi Company holds the exclusive rights in the British Isles.

Naturally, in the present state of emergency, we shall be only too happy to co-operate with any gas engineer who may be interested in this system.

Yours faithfully,
FRANK RITSON,
Director and Manager.

Gas Chambers and Coke Ovens, Ltd.,
Artillery House,
Westminster, S.W.1.
Jan. 8, 1947.

Personal

Mr. W. E. REED has been appointed Technical Director of Ewart & Son, Ltd.

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Mr. A. SMALLEY, Manager of the Rothwell Gas Department since November, 1933, is leaving on Feb. 1 to take up a new appointment at Colne Valley, Huddersfield.

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Mr. C. S. W. HARRISS, Secretary of the Imperial Continental Gas Association, has been appointed Assistant Manager and Secretary. Mr. W. N. DEVONSHIRE, O.B.E., has been appointed Assistant Secretary.

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Miss NORA WRIGHTON, who holds the Household Management Diploma, has recently been appointed Home Service Demonstrator to the Nottingham Gas Department. She was previously employed in the Food Advice Section of the Ministry of Food.

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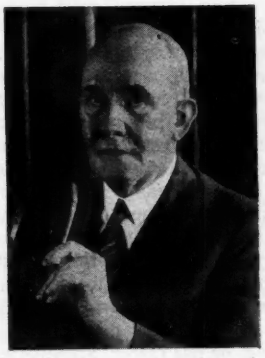
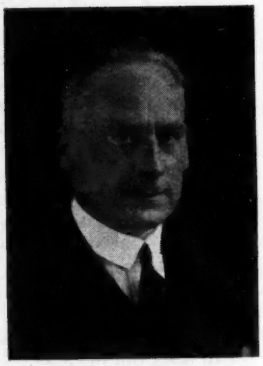
Mr. DUNCAN D. MELVIN has been appointed Engineer and Manager of the Edinburgh Gas Department, in succession to Mr. J. Jamieson, whose retirement was announced recently. Mr. Melvin is a native of Rutherglen, near Glasgow, and was educated at Rutherglen Academy and the Royal Technical College, Glasgow. He received his early training at Dalmarnock Works of the Glasgow Gas Department, and was appointed Assistant Engineer and Manager to the Uddingston Works of the County of Lanark in 1924, being promoted to the position of Engineer and Manager shortly after. He joined the staff of Edinburgh Gas Department as Assistant Engineer and Manager in 1933, and was made Deputy Engineer and Manager in 1939. Mr. Melvin is a Past President of various Gas Associations, and is at present Junior Vice-President of the North British Association of Gas Managers. During the first World War he served in the Royal Scots and was twice wounded, and during the last war he was responsible for the organization and operation of the A.R.P. scheme for the Gas Department; he also acted as District Gas Engineering Adviser for Edinburgh and the South-East of Scotland.



Mr. J. Jamieson



Mr. D. D. Melvin

Mr. GEORGE GILFILLAN, Greenock, has been appointed Assistant Manager of the Dumfries Gas Department.

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Mr. C. HINDLE, Works Superintendent of the Cambridge University and Town Gas Light Company, and formerly Technical Assistant in the Nelson Gas Department, has been appointed Works Superintendent of the Darlington Gas Department.

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On the occasion of his resignation from the position of Engineer and Manager of the Oswaldtwistle Gas Department to succeed Mr. D. K. Green in a similar position at Leek, Mr. S. TOMLINSON JONES was the recipient of presentations from the staff and workpeople of the Department and from the Blackburn and District Organists' Association, of which he was a Vice-President.

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Mr. W. O. SHILDRICK, who has just retired from his position with R. & A. Main, Ltd., represented the firm for 48 years in the Southern part of England. He is succeeded as Representative by his son, Mr. W. J. O. SHILDRICK, who has already taken up his duties following his war service. Mr. W. O. Shildrick was recently entertained to lunch by many of his old colleagues, when a presentation was made to him.

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In addition to the New Year Honours announced last week, Miss EDNA HELENA SMITH, who joined the staff of the Rochester, Chatham, and Gillingham Gas Company 15 years ago, was awarded the M.B.E. in recognition of her services as assistant to the Regional Controller of the Ministry of Fuel and Power, Mr. G. le B. Diamond. Before the war Miss Smith was Assistant to the late Mr. W. Valon Bennett, Manager of the Company.

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Mr. F. CRADDICK, Secretary of the Rushden, Higham Ferrers and District Gas Company for the past 12 months, has left after 28 years in the service of the Company to take up an important position with the Kettering Gas Company. The Rushden undertaking, now known as the Rushden District Gas Company, has appointed as its Secretary Mr. W. D. BATES, formerly of Higham Ferrers. Now holding a post in Bristol, Mr. Bates was recently Secretary and Accountant to the Minehead and Wellington Electricity Companies.

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Lieut.-Colonel C. H. TOWNSEND, a son of the late Mr. W. W. Townsend, of Colchester, has been appointed Assistant Engineer of the Rochester, Chatham, and Gillingham Gas Company. He was educated at Haileybury College and Imperial College, London, and graduated with B.Sc.(Eng.) Second Class Honours, obtaining practical engineering training at the L.M.S. locomotive shops at Derby. He subsequently became Assistant Engineer of the Trafford Park Works of Thomas Hedley & Co. During the recent war he was mobilized as a member of the Supplementary Reserve of Officers, and after passing through several Engineering Units, was eventually appointed Adjutant of R.E.M.E. in the 46th Division. He served overseas in North Africa and Italy and was finally demobilised in February, 1946.

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Mr. TOM ORR has retired after 56 years' uninterrupted service with the Motherwell Gas Company, and later with Motherwell and Wishaw Gas Department. He joined the undertaking when Motherwell's first Provost—the late James Russell, J.P.—was Chairman of the Motherwell Gas Company. Soon after the amalgamation of the burghs of Motherwell and Wishaw, Mr. Orr published a historical survey of the two burghs. At a ceremony attended by members of the gas-works staff Mr. and Mrs. Orr were the recipients of presentations made by Mr. W. Kirk, Engineer and Manager. Mr. Orr was one of the founders of the Scottish Junior Gas Association, and at the annual meeting of the North British Association of Gas Managers last year, the President recognized Mr. Orr's 50th anniversary attendance at the meetings of the Association.

Obituary

The death occurred on Dec. 31 of Mr. AUSTIN B. AUTY, General Manager of Clapham Brothers, Ltd., Keighley. Mr. Auty had been in the service of the Company for 42 years and was appointed General Manager four years ago.

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Mr. FRANK H. SWAIN, Sales Manager of the Davis Gas Stove Co., Ltd. (Radiation, Ltd.), since 1929, died on Jan. 7, age 53. His health had been failing for some time, but he had attended regularly to his duties until the end of November. His many friends in the Gas Industry will mourn his untimely passing.

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Mr. CHARLES PAWSON, of George Bray & Co., Ltd., Leeds, died on Jan. 5. He joined the Company at the age of 14 and for 58 years held successive responsible posts, being instrumental in bringing about many improvements in the Company's products. He travelled a good deal and his cheerful and energetic disposition made him many friends. He leaves a son, who is now Secretary of the Company.

Diary

Jan. 16.—Solid Smokeless Fuels Federation: Executive Committee. Dorchester Hotel, 11.30 a.m.
Jan. 18.—Manchester and District Junior Gas Association: "Corrosion on Gas-works," A. J. Brandram (United Kingdom Gas Corporation).
Jan. 22.—London and Southern District Junior Gas Association: Visit to Neasden Works of Ascot Gas Water Heaters, Ltd.
Jan. 23.—Industrial Gas Development Committee, Gas Induatry House, 10 a.m.
Jan. 25.—Western Junior Gas Association: Prospective Industrial Paper.
Jan. 25.—Yorkshire Junior Gas Association: Discussion, Wakefield.
Jan. 28.—Southern Association of Gas Engineers and Managers (Eastern District): "The Principles of Purging Gas Plant and Holders," L. Silver. Gas Industry House 2.30 p.m.
Jan. 28.—Midland Junior Gas Association: "Industrial Heat Treatment," L. D. Creedy, Birmingham.
Feb. 2.—Midland Junior Gas Association: Visit to the Keresley Colliery of the Coventry Colliery Company (first party).
Feb. 7.—London and Southern District Junior Gas Association: "Some Investigations on Leakage from Distribution Systems," C. D. Shann. Gas Industry House, 7 p.m.
Feb. 9.—Midland Junior Gas Association: Visit to the Keresley Colliery of the Coventry Colliery Company (second party).
Feb. 11.—Midland Junior Gas Association: "The Engineer and the Accountant in the Gas Industry," R. Thompson, Bilston.
Feb. 12.—Manchester and District Junior Gas Association: Visit to Works at Trafford Park. Paper, "Industrial Gas," T. H. Pardoe (Stretford).

Scottish Building Centre

Colonel G. Gardner-McLean, O.B.E., presiding at the ninth Annual General Meeting of the Scottish Building Centre at Glasgow on Dec. 24, expressed keen satisfaction with the progress made during the year. Not only had there been an encouraging increase in the number of exhibitors and of exhibits, but there was also a gratifying improvement in the number of visitors, especially during the last three months, while technical enquiries were considerably higher than at any time in the Centre's history.

The year had opened with promising signs, and there was every reason to anticipate that satisfactory progress would be maintained. The numbers of visitors and of enquiries during the first two months were substantially above the average for the same period of the previous eight years; several new exhibitors had already taken space, while negotiations were being actively pursued with other manufacturers of whom some would undoubtedly install exhibits in due course. The Centre, said Colonel McLean, is probably more representative to-day in its variety of exhibits than at any time, and the policy of extending the range of exhibits so as to be as widely comprehensive and representative as possible is being vigorously pursued.

Rushden and Raunds Unite

"Building for the Future" was the theme of a speech by Mr. James Roe at Rushden, on Jan. 1, when the Raunds Gas Light and Coke Company formally transferred to the Rushden District Gas Company in accordance with the Rushden District Gas Act, 1946.

Mr. Roe, as Chairman of the new Company, referred to the amalgamation as a great transaction. "To-day," he said, "is unique in our history. May we be successful in our endeavours and may our labours be of lasting benefit to the neighbourhood in which we live and serve." The fine new plant they had hoped would be complete and able to meet the combined peak winter loads of the united undertaking was not yet in commission. The delay was to be regretted, but it had been occasioned by many vexatious shortages and restrictions. Every nerve was being strained to ensure that the demands of the public were met and progressive development was the dominant aim.

Mr. Roe welcomed as Directors Messrs. T. C. Smith and J. W. A. G. Adams, who had been with the Raunds Company, and spoke of the service given to the Industry by Messrs. J. C. Horrell, H. Lawrence and W. Bolton, three other Raunds Directors who now retire.

The resolution vesting the Raunds undertaking in the new Company was carried unanimously.

At the close of the business, Mr. Roe, on behalf of the Rushden Directors, presented a silver cakestand to Mr. J. F. B. Craddick, Secretary, who was leaving to take up an appointment at Kettering after serving the Rushden and Higham Ferrers District Gas Company for 28 years.

News in Brief

The Five-day Week has been adopted by C. R. Averill, Ltd., make of graphite paints, &c., and in future the works and offices will be closed from Friday night until Monday morning.

Mansfield Town Council has agreed to pay an increased price for bulk supply of gas from the Grassmoor Co., Ltd. The price will be 1s. 1⅛d. per 1,000 cu.ft., compared with 6d. The price to consumers will have to be increased.

Mr. G. A. Isaacs, Minister of Labour, stated recently that the proportion of applicants under the Business Training Scheme who had been rejected as ineligible or unsuitable was approximately 52%. Applicants who had been rejected would not be accepted at a later date.

The Staff of the City of Coventry Gas Undertaking held their second annual Dinner Dance and Social at the Central British Restaurant, Coventry, on Jan. 3. With Mr. J. E. Wakeford, Engineer and Manager, in the Chair, 86 members of the staff with their guests were seated at dinner and others joined the party later for the dance and social.

The Physical Society has planned to hold the 31st Exhibition of Scientific Instruments and Industrial Apparatus on April 9-12 instead of in January, in the Physics and Chemistry Deartments of Imperial College, South Kensington, London, S.W.7. Tickets are obtainable early in March from Fellows of the Society, and from exhibiting firms.

Speaking at a Recent Dinner to long-service employees, Mr. C. G. Fraser, Managing Director of N. Greening & Sons, Ltd., woven wire manufacturers, of Warrington, said that invitations had been issued to 127 employees whose aggregate service totalled more than 4,500 years. Of those who had been with the Company for 25 years or more, 112 were actually at work on VJ Day.

"**Careers in the Gas Industry,**" published by the Institution of Gas Engineers, has now been officially released for distribution. Copies can be obtained from the Secretary of the Institution, 1, Grosvenor Place, London, S.W.1, at 2s. 6d. each, or delivered at the following rates: One to three copies, 2s. 9d. per copy post free; four to 20 copies, 2s. 7d. per copy post free; more than 20 copies, 2s. 6d. per copy, plus postage. Editorial comment on the new book will be found elsewhere in this issue.

A New Booklet issued by the Lead Industries Development Council contains 16 pages of useful information about lead and lead alloy pipe and sheet for building work, including numbers and summaries of British Standard Specifications. Copies are available from lead manufacturers. Among the special features of the booklet are tables of data such as weights of lead sheet, sizes and weights of pipe recommended for various purposes, sizes and weights of silver-copper-lead pipe recommended for conveying water under pressure, and external diameters of lead pipe. Lead soil pipe and compo pipe for gas and other uses are also covered.

Gas-operated Radio is a novelty which has appeared in America recently for publicity purposes. By means of a Milne thermo-generator, gas is used to operate an ordinary radio—although, of course, gas is only the means of producing the electrical supply. The principle by which electricity is produced from a gas flame or any other source of heat was first discovered by Seebeck, who noticed that an electric current was produced in a closed circuit by heating the point of contact of two dissimilar metals, known as the Seebeck Effect. Considering the relative costs of gas and electricity there is little future for this system of operating a radio, but it remains an amusing and interesting experiment.

Canadian Sales of manufactured gas by distributing companies during August totalled 1,678,776,000 cu.ft., an increase of 59,445,000 cu.ft. on the total for a similar period during 1945. Of this amount 992,292,000 cu.ft. were for domestic purposes, other than house-heating; 373,816,000 cu.ft. for industrial use; 288,064,000 cu.ft. for commercial use; 20,700,000 cu.ft. for house-heating, and 3,904,000 cu.ft. for other uses. Sales of natural gas during August amounted to 1,308,333,000 cu.ft. The sales figures represent sales by distributing companies to customers; amounts used by producers are not included.

The Government, through the Department of Scientific and Industrial Research, has decided to establish a comprehensive fire research organization, jointly with the Fire Officers' Committee. A Fire Research Board has been appointed jointly by the D.S.I.R. and the F.O.C. The members serve in their personal capacity and not as representatives of any organization to which they may happen to belong. A Fire Research Station will be jointly established. The capital cost is likely to be in the order of £75,000 to £100,000 and the ultimate annual running cost up to £50,000, both shared equally between the D.S.I.R. and the Fire Officers' Committee. The broad subjects on which research will be undertaken are: Preventing the occurrence of fires; methods and equipment for extinguishing fires; fire resistance of buildings, properties of building materials, and elements of structure, safety of life in fires (*e.g.*, means of escape, the prevention of the spread of fire within buildings and from building to building); and other hazards, including special industrial hazards.

The Ministry of Fuel and Power has approved the erection of new carbonizing plant for the Spalding Gas Department at an estimated cost of £46,500.

A Scheme for the provision of new manufacturing plant at the Birkshall works at an estimated cost of £742,720 has been approved by the Estimates Sub-Committee of the Bradford Corporation, together with a tender from Robert Dempster & Sons, Ltd., for the erection of coal handling plant. Consideration of a £107,950 distribution scheme has been adjourned so that full details may be provided with regard to order of priority.

Wolverhampton Gas Company considerably increased its plant during the war years, but there has been a corresponding increase in the demand for gas. Output double that of pre-war was a record on a recent Sunday. The Company, in a statement, points out that plant is strained to capacity, with no margin for breakdown or emergency, and that unless consumers assist by effecting substantial economies it will not be possible to maintain full supplies at existing pressure.

Newcastle-on-Tyne and Gateshead Company has almost completed the construction of a new 3,000,000 cu.ft. gasholder at South Gosforth, Newcastle, and it is expected it will be in operation by March. The holder has cost £115,000 and taken two years to build. The concrete water tank surrounding the holder has a capacity of 5,500,000 gall. After tests have been made with the holder, it will be filled with gas which will serve the High Heaton, Longbenton and Kenton areas. Eventually it is intended to paint the holder in order that the colouring will merge with the surrounding countryside and help to prevent it being an eyesore. Shrubs will also be planted around it.

Accrington District Gas and Water Board has decided to seek the approval of the Ministry of Fuel and Power of a £35,000 scheme to improve the gas supply by installing a new larger bore pipeline between Great Harwood and the borough to replace one 26 years old, and installing booster plant at Great Harwood. Mr. A. Harrison, General Manager, reported that this was part of major schemes to increase supplies and distribution. Mentioning the heavy increase in gas output, Mr. Harrison said reduced quantities of gas were coming from suppliers, and demand still exceeded supply. With economy by the public the Board could get through. The position has been aggravated by the recent breakdown at Harwood of plant on test and not yet taken over by the Board. Though it had been restored to service after six days' continuous work by the Board's staff, it was not yet fully satisfactory.

In the Annual Report for 1945 of the Chief Inspector of Factories, the Senior Medical Inspector of Factories refers to the high incidence of tar cancer. Eighty-three of the notified cases were due to pitch, 93 to tar, the highest figure yet recorded for this cause: three were due to paraffin (shale oil refining) and 36 to mineral oil. Of the 176 cases due to pitch or tar 16 occurred in patent fuel works, 90 in tar distilleries including coke ovens, and 43 in coal gas-works, while the remaining 27 cases were distributed thus: Optical lens manufacture (11), cable manufacture (four), electric brush manufacture (four), timber creosoting (two, one death), six sundry occupations with exposure to pitch or tar contributed one case each. The anomaly noted in the 1944 Annual Report is again recorded as to the restriction to gas-works in the London area of notifications from this Industry of cases in the early stages of epitheliomatous ulceration from pitch and tar.

Modern Homes Exhibition

Where does Britain stand to-day in meeting the demands of the people for homes, furniture, and household equipment? How far has the Government's housing scheme advanced? What progress has been made during the past 12 months by architects, builders, designers, and manufacturers to meet the urgent practical needs of the people? What have our inventors, factories, and workshops achieved in the way of labour-saving devices and appliances? And what is for the home market?

The answers to these questions, we are informed, will be found at the 1947 Modern Homes Exhibition, which opens at Dorland Hall, Regent Street, S.W.1, on Mar. 25. The exhibition, the 1945 and 1946 editions of which attracted hundreds of thousands of people from all over the British Isles and from overseas, is organized by the *Daily Herald* in collaboration with Ministries, Government Departments, industry, and official and semi-official associations and committees. The exhibition, employing the latest ideas and the most modern technique in exhibition presentation, will, it is claimed, not only present a vivid, informative, and realistic picture of what has been done and is to be done in using the nation's resources, skill, inventiveness, and enterprise in solving the vast national problem of housing, but will also deal with home-making. The exhibition will be essentially practical. Features will include full-scale gas kitchens, fully equipped. There will be, too, the kitchen which the Ministry of Health is introducing into its 1947 housing scheme.

Gas and the Fuel Situation

By J. R. W. ALEXANDER,
General Manager British Gas Council

THE risk of interrupted gas supplies continues to increase, although the danger is greater in some areas than others and not necessarily for the same reasons.

Apart from the serious overall shortage of coal, that allocated to the Gas Industry is frequently not suitable for gas making purposes, which results in plant not being used efficiently or to capacity. Unsuitable coals may result in the gas produced per ton of coal carbonized being reduced by as much as 14%.

Despite every effort made during the summer to secure adequate deliveries of suitable coal, gas undertakings started the winter with an average coal stock of three and a half weeks' consumption, as compared with six weeks in pre-war days, when any interruption in supply was relatively speedily remedied. The stock has now declined to two and a half weeks and is likely to be further reduced to an average of not more than one and a half weeks by the end of January. This means that an individual undertaking may have only a few days, or even hours, supply of coal on its works, which may constitute an unworkable margin.

Coal consumption by gas-works usually increases week by week during January and February to its maximum. Over the last six weeks the average weekly consumption has been 494,000 tons against deliveries of 470,000 tons, leaving 24,000 tons a week to be drawn from the undertakings' dimishing stocks. During a recent week 70,000 tons were taken from stock and such formidable deficits are likely to increase. Apart from the fact that the mines are not producing enough coal to meet the nation's requirements, there is—in addition to seasonal difficulties—a critical "bottleneck" in the transport of coal, largely owing to the lack of locomotives and wagons. The present emergency measures of moving coal allocated to one industry to another—often robbing a provident Peter to pay a prodigal Paul—not only adds unnecessarily to the transport burden, but brings nearer a major fuel crisis which will personally affect every man, woman, and child in this sorely tried country.

Inadequate Gas-works Plant

In most undertakings the coal shortage difficulties are increased by reason of gas-works plant not being adequate to meet the demand. The wear and tear on gas making plant, which operates 24 hours a day throughout the year, is heavy at any time, but plant is now being grossly overworked. Not only has it been impossible, owing to shortages of labour and materials, to complete much needed extensions, but during the last seven years it has been impracticable fully to maintain and repair plant and so keep it in good condition. Such difficulties are particularly acute in undertakings which experienced extensive war damage. But the repair, maintenance, and extension of plant cannot be expedited beyond a certain point, owing to the Government's building commitments and the shortage of labour and materials.

The Gas Industry is using every effort to overcome these difficulties, realizing that any failure in the supply of gas to its domestic, industrial, and commercial consumers can have a serious effect upon the life of the community, as was realized following air raid damage during the war, when the Industry was able, paradoxically enough, to meet the enormous demands made upon it.

There continues to be a shortage of personnel in every section of the Gas Industry, especially of skilled men, who need specialized training and experience to discharge their duties properly. The Gas Industry has a long and unequalled record in the harmony of its relationship with its employees, although there have been a few isolated instances of trouble since the cessation of hostilities.

Increased Gas Demand

The demand for gas has increased considerably since the outbreak of war and shows no signs of diminishing. The householder has more money to spend on maintaining more satisfactory standards of heating, cooking, and hot water supply; the shortage of domestic staff discourages the use of solid fuel; and consumers are disposed to use gas, which is uncontrolled, and so conserve coal and coke, which are rationed.

The extensive use of labour-saving gas appliances in the building of new and the conversion of old houses continually adds to the demand for gas, while the requirements of industry—anxious to take advantage of a fuel which can be readily and efficiently applied and controlled—cannot immediately be met in all cases. The domestic consumption of gas in 11 million households has risen by 30% during the past 10 years, whilst the demand from industry increased by 70% between the years 1938 and 1944. Since commodity output is dependent upon fuel, it is unfortunate—especially in view of the need for maintaining exports in markets which are already becoming more discriminating—that restrictions upon the consumption of fuel should have had to be placed upon industry by the Government.

Elaborate arrangements were made on more than one occasion during the war for the introduction of overall gas rationing, but the schemes were abandoned as impracticable. It is almost impossible fairly and effectively to ration a domestic fuel obtainable by the turning of a tap and the consumption of which cannot be checked until the meter is read, when remedial measures, even if in time, are not easy to apply. It would, in any event, be difficult effectively and equitably to ration gas overall at short notice, owing to the complexity of the arrangements which would have to be made. No form of control would be more unpopular with the housewife. Consumers needs vary considerably and are effected by the type of house and appliances in use and temporary considerations such as illness. Presumably, too, gas rationing would have to be related to the individual consumer's stock or use of solid fuel, or the consumer relying entirely or mainly upon gas would be prejudiced.

While the circumstances vary considerably throughout the country, the possibility of interrupted supplies is appreciable in some undertakings, especially if prolonged cold weather is experienced or there is any breakdown in plant or the supply of coal. Strict and sustained economy by consumers is imperative; occasional flashes of conscience are not enough. The British Gas Council, in collaboration with the Ministry of Fuel and Power, has drawn the personal attention of consumers to the situation, is seeking their contructive co-operation, and is affording them instruction as to the care of appliances and their economic operation.

Housewives can help when gas pressure is reduced and during period of peak demand, for example between the hours of 11.30 a.m. and 1.30 p.m. This can be done by preparing dishes in advance, by serving meals a little earlier or later, by allowing longer for cooking and by discouraging the use of large quantities of gas for heating and the provision of hot water.

Effects of Pressure Reduction

A moderate reduction of pressure has no serious practical consequence upon the use of the domestic gas appliance. The supply is continuously maintained, but there would be a slight decline, often unnoticed, in the heat effectively available, such falling-off being appreciably less than the percentage pressure reduction.

But should the reduction of pressure be such as to deprive the consumer of gas, for all practical purposes, great care should be taken at once to turn off all taps, remembering particularly those appliances which have permanently lit burners, as on refrigerators and certain types of hot water heaters. After the gas pressure has been restored, all apparatus should be checked to see that none was inadvertently left turned on when the gas supply ceased and caution should be exercised in re-lighting appliances. If these precautions are not taken an explosive mixture of gas and air may be created in mains, services, or appliances. It is still necessary not to use a naked flame when gas is smelt or is to be suspected.

If every effort is made to maintain the supplies of suitable gas making coal to gas undertakings and the utmost priority is given to the labour and materials necessary to plant repairs and extension, and this is coupled with real economy on the part of consumers, gas undertakings have every hope, if the worst comes in a particular district, of restricting to brief periods any reduction in gas pressure.

But should there be an overall breakdown in the supply of gas, the critical effect upon the life of the community cannot be over-emphasized. It has never been experienced, hence the difficulty of appreciating what would be involved and the result, not only upon the industrial, commercial, and domestic activities of the nation, but upon the morale of the people.

Visits to Germany

Arrangements have now been made to allow business men to visit the British and American zones in Germany for commercial purposes. Owing to the limited facilities in accommodation and transport, applications can only be considered from persons having a specific purchasing transaction in view.

Applications should be made in the first instance to Sundry Materials Branch of the Board of Trade, 10, Old Jewry, E.C.2. They should be accompanied by firm enquiries for specific goods and in particular the names of the German suppliers with whom they wish to deal, should be stated. Some evidence such as correspondence with the German suppliers concerned to show that they are in business and may be in a position to produce the goods required should also be given. The application should give reasons why a visit to Germany is regarded as desirable. Imports from Germany will continue to be handled by Sundry Materials Branch.

More "Britain Can Make It" Exhibitions

Triumph of An Act of Faith

FULLY alive to the importance of design in industry, the Gas Industry took a worthy part in the "Britain Can Make It" Exhibition, which closed at the Victoria and Albert Museum on Dec. 31. While the exhibition was still running, some of the ideas presented became the basis for the Industry's own "Gas in the Design for Living" Exhibition at the Housing Centre. Mr. S. C. Leslie, Director of the Council of Industrial Design, under whose auspices the exhibition was held, told a Press conference on Jan. 8 that it was not the intention of the Council to rest on the success of that single exhibition. There would be other "Britain Can Make It" Exhibitions, and an announcement would be made later about the intervals at which such national exhibitions would be held.

Although the difficulty of securing sites of sufficient size in the provinces has made it impracticable to move the whole exhibition or any large part of it elsewhere, there will be "off-shoots" of it. The Council, in association with the Federation of British Industries, and, it is hoped, with the co-operation of local chambers of commerce, intends to organize a series of local "Design Weeks" in various provincial centres. These will include meetings and conferences, and possibly window display competitions. One important feature will be a small travelling exhibition containing a few of the furnished rooms, the section on Industrial Design, and a limited selection of domestic commodities from various sections of the "Britain Can Make It" Exhibition.

Britain's Longest Queue

In its 14 weeks' run, a total of 1,432,369 people visited the "Britain Can Make It" Exhibition, and in terms of public attendance it was an outstanding success. From the purely monetary point of view of profit and loss it was not a paying proposition, the total expenditure being about three times the total takings, but it was not conceived with the immediate profit motive in view. For over two months the longest queue in Britain was the one which stretched away from the doors of the Victoria and Albert Museum. From enquiries made among a cross-section it seems that 40% of the visitors were Londoners, 25% lived within 25 miles of the capital, and some 35% came from further afield. Three-fifths of the visitors appeared to be under 40 years of age, and the children numbered 161,000. The results of the exhibition, however, are to be assessed not merely in terms of numerical attendance but also in terms of the results achieved for British industrial design and British industry.

The exhibition was publicly launched ten days after VJ Day. Most of the commodities were submitted within 15 months after the end of the European war. Many regarded the decision to hold an exhibition so soon after the end of a total war effort on industry's part as a gamble, but the Council of Industrial Design preferred to regard it as an act of faith, and it was justified by the result. The Selection Committees appointed by the Council had 15,836 items submitted to them from 3,385 firms. This number of firms was over 1,000 more than those taking part in the last pre-war British Industries Fair in 1939. The Selection Committees chose 5,259 articles from 1,297 firms. It was a significant testimony to the speed of reconversion that in face of all the well-known difficulties manufacturers were able to indicate that by the end of 1946 some 50% of the goods in the exhibition would be available to some extent for the home market, and more than 60% for export.

The setting of the exhibition, which found almost universal favour at home and abroad, fully realized the Council's wish to demonstrate the outstanding capacity of Britain's young experts in this field. The technique of displaying our goods has been one of the weakest aspects of British salesmanship. The designers and artists who created the setting of the "Britain Can Make It" Exhibition can be credited with making good this weakness in a single stride.

Captured World Interest

From the point of view of export trade the exhibition was launched to demonstrate that the quality of British goods was equalled, in the case of the best, by the excellence of their design. The exhibition was not conceived as a trade fair intended to capture immediate overseas orders, but as a demonstration of quality—a long term national prestige advertisement. The response exceeded the Council's expectations. The exhibition came at a time when it captured the interest and imagination of the world.

Although the Council was careful to emphasize that the exhibition was not a trade fair the opening brought a substantial volume of trade enquiries from both home and overseas buyers. The Council established a trade enquiry section, and the records show that 43,300 people from this country with a commercial interest in the goods as retail buyers, wholesale buyers, or shopkeepers, visited the exhibition. These figures are based on the numbers who used the special facilities available for the trade, and there were undoubtedly many thousands more with trade interests who attended as members of the public. In addition to home trade buyers, 7,106 buyers with whom the Council had contact came from overseas, representing 67 countries.

Unofficial estimates of the volume of orders resulting from the exhibition have been published, varying from £25,000,000 to £50,000,000, but it is impossible to give any reliable estimate of the real figure. Two facts, however, are clear. "Britain Can Make It" brought trade orders to Britain in very great volume which would not have been received if the exhibition had not been held; and it is plain from reports from exhibitors that any gaps which existed in their order books when the exhibition opened have been filled to overflowing. There is evidence also of a great "over-spill" of orders to other firms from buyers who found the exhibitors' order books full.

These direct trading results were not part of the purpose of the exhibition, but were, as it were, a bonus to industry over and above the other and less measurable results which were really aimed at. The effect of the exhibition on the design policies of manufacturers, exhibitors and non-exhibitors alike, has been striking. From reports received by the Council it is evident that industrial design is now "on the map" so far as British manufacturers and traders are concerned to a greater extent than ever before.

Public Opinion

A detailed investigation carried out by Mass Observation shows that 64% of the visitors thought the exhibition "very good"; 16% said it was "good"; 17% expressed some degree of disappointment; and 2% thought it was "bad." Four out of five on leaving the exhibition said they had enjoyed it, and only two in 100 expressed the opinion that it was bad. It was significant that 44% of the men and 42% of the women interviewed said that their tastes had been altered by what they had seen. Some visitors, by their own permission, were interviewed in their own homes, and although some of those interviewed had said their tastes had not been altered, in every home visited some alteration was planned or some new article marked down for acquisition as a result of what had been seen at the exhibition.

Mr. Leslie, in concluding his statement, said it seemed to him to be beyond dispute that in industrial prestige, in export orders, and in the direct promotion of higher standards of industrial design, as well as from the standpoint of the British public, the exhibition had been fully justified by its results.

Calendars and Diaries

Although Christmas and New Year cards were plentiful this season the continued scarcity of complimentary calendars and diaries from business houses which before the war observed the long established and friendly custom of sending them to their business friends reflected the persistent paper shortage and the effect of purchase tax and printing difficulties. We acknowledge, however, with thanks, and reciprocate the greetings expressed by the senders of the following:

Calendars: British Vacuum Cleaner and Engineering Co., Ltd. (giving an artist's impression of a vacuum cleaner demonstration 43 years ago); Westwood & Wrights, Ltd.(with a weekly circular tear-off); North British Rubber Co., Ltd. (a coloured golf history reproduction in resumption of a popular pre-war series). Stewarts & Lloyds, Ltd. (a tasteful desk calendar of the semi-perpetual type, with monthly change).

Diaries: Standard Furnace and Setting Co., Ltd.; British Vacuum Cleaner and Engineering Co., Ltd.

Structural Insulation Association

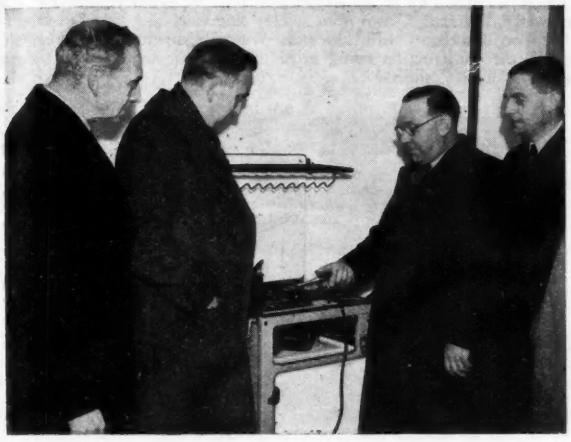
Reference was made in the "JOURNAL" of Oct. 23, 1946 (page 682), to the formation of the Structural Insulation Association by representatives of ten different industries, all producing structural insulating materials, with the object of raising the standard of thermal insulation in all types of buildings and providing a source of general information and assistance on thermal insulation materials and their availability.

Mr. J. P. Smith, Chairman of the Association, now informs us that considerable progress has been made in drawing the attention of certain Government Departments, as well as other public authorities, to the desirability of giving increasing consideration to the advantages to be derived from higher standards of thermal insulation of buildings. The membership of the Association has increased, and now includes the majority of the trade associations and suppliers concerned in the manufacture of structural thermal insulating materials. The Association has presented a short survey of present day materials as an initial guide to those interested in the very important subject of insulation.

The Association now has its headquarters at National House, 14, Moorgate, London, E.C.2, with Mr. H. F. Payne as Secretary, and Messrs. Percy Mason & Co. as Treasurers and Accountants.

Weaverham on the Map

The village of Weaverham, Cheshire, with a present population of about 5,000, has been placed on the map so far as gas supply is concerned. As part of the policy of the United Kingdom Gas Corporation and its subsidiary companies it was decided to supply gas as soon as possible to this village which, while in the area of supply of the Northwich Gas Company, has not been previously served.



Mr. N. Aitchison, J.P., Chairman of the Northwich Rural District Council, lighting the first gas cooker in Weaverham village. The group includes Mr. Birtwistle, Surveyor to the Council, Mr. H. Bradbury J.P., a Director of the Northwich Gas Company, and Mr. J. H. Richmond, General Manager of the Runcorn and Northwich Group of Gas Companies.

The project was surveyed, planned, and carried out by the Northwich Gas Company, and involved the laying of just over three and a half miles of 12 in. main. The house in which the photograph was taken is one of the first houses to be erected by the Northwich Rural District Council, and there are a further 750 to be erected on the site. Five other housing schemes are being carried out by the Council, and the Gas Company has secured orders for a gas cooker and gas boiler to be fixed as part of the standard equipment in all houses where gas is available. During the next two years it is expected that 1,000 houses will be built in various parts of the Northwich Gas Company's area of supply.

Science of Running a Home

Over 13,000 women sought solutions of their cookery and home problems at the offices of the Newcastle-upon-Tyne and Gateshead Gas Company during 1946. In a special article in the local *Weekly Chronicle* Audrey Hall recalls that until 1937 the main part of the advice the Home Advisory Service gave was related to cookery problems.

During that year booklets were sent out to women's organizations in the area telling them that among the many lectures, &c., given by the Home Advisory Service were cookery, menu-planning, dietetics, food preservation, health, homecraft, home laundry, kitchen planning, special courses, colour schemes, sweet-making, icing and decorating. With the increasing difficulties arising in the home, even more services have been added.

The department takes the view that the old story that just because you happen to be a woman you were born knowing how to cook and to run a home is all just so much empty talk.

"Housework and cookery have at last been recognized as a science," Miss Mary Strong, a demonstrator, told the author. Thousands of women seem to agree with her and more and more are turning up at the lectures and demonstrations.

Recently the department ran a course of Christmas fare demonstrations and 3,000 women applied for tickets. The demonstrations were extended, but still the applications poured in.

Women who had lost their cooks during the war and were unable to themselves cook went along to the demonstrations to learn with young brides and other housewives how to run their home. A special course was given for the "cookless wives" and instead of the two or three hundred expected, 800 applied for the course.

Eight centres were set up in Newcastle, South and North Shields, and in other districts, to cope with the demand. Townswomen's Guilds and Women's Institutes are taking advantage of the scheme whereby a demonstrator attends one of their meetings and shows them "how."

North of England Auxiliary

The 47th half-yearly meeting of the North of England Gas Managers' Association (Auxiliary Section) was held at the West Hartlepool Gas Showrooms on Dec. 13. The members were welcomed by Mr. J. R Bradshaw, J.P., Director and General Manager of the Hartlepool Gas and Water Company. Mr. J. R. Cleator, Southbank and Normanby Gas Company, occupied the Chair.

A Paper was read by Mr. D. B. Laws, Sunderland Gas Company, on "Observations on Gas-works Routine and Coal Conservation," and another Paper by Mr. S. G. Irvin, Newcastle and Gateshead Gas Company on "Factors Affecting the Future Development of Gas Manufacture." These were followed by discussion and a vote of thanks to the readers of the Papers was proposed by Mr. W. A. Pask (Darlington) and seconded by Mr. S. A. Tait (Stanley).

After the meeting the members were entertained to tea at the Grand Hotel by the Directors of the Hartlepool Gas and Water Company.

Gas and Rate Relief

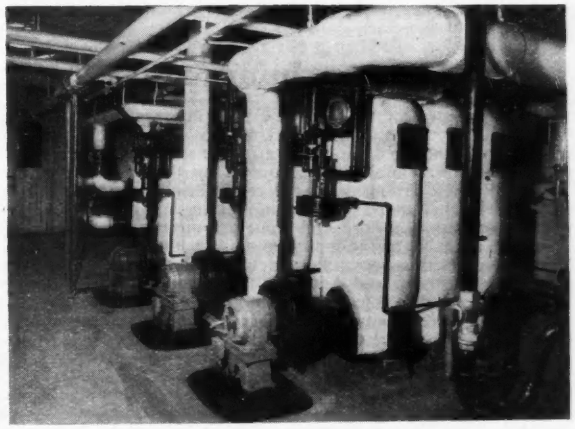
During the financial years ended Mar. 31, 1945 and 1946, and for the first time since the suspension of the practice in 1934, the Walsall Gas Department has been called upon to transfer in relief of rates a portion of profits amounting to 1½% of the outstanding debt of the undertaking. This is supposed to be in line with the provisions of the Electricity (Supply) Act, 1926, but in fact it is not, because this Act includes a clause to the following effect: "No electricity profits may be transferred in aid of rates unless the reserve fund of the electricity undertaking amounts to more than 5% of the aggregate capital expenditure on the undertaking."

As the reserve fund of the Walsall Gas Department does not amount to 5% of the capital expenditure it is clear that the undertaking has been called upon to give aid in respect of rates in circumstances in which an electricity supply undertaking, in a similar financial position, could not have been called upon.

Referring to the presentation of the annual report of the Department, the Chairman of the Gas Committee was reported in the "JOURNAL" of Dec. 25 (page 1152) to have said that the Committee wanted to install a further 200 street lamps if supplies were available. The words "of mantles" should have been inserted after the word "supplies." Mr. A. Allen, General Manager and Chief Engineer, asks us to mention this because a firm of lantern makers has written offering him early delivery of lanterns. It is not lanterns, but mantles, that are in short supply.

A Municipal Hostel

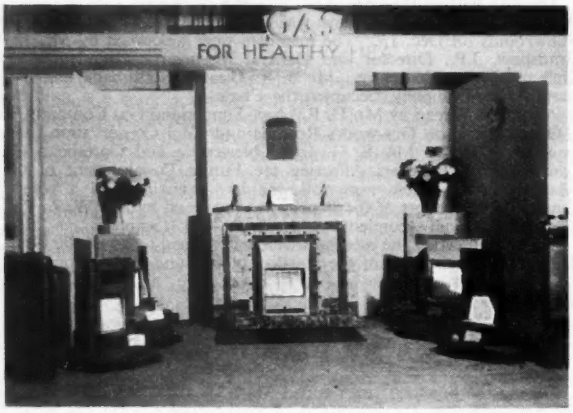
Gas is used as the main source of heat at Shaftesbury House, Besston Road, Leeds, a municipal hostel run on hotel lines for the lower income groups who cannot afford the prices charged by ordinary hotels.



The gas-heated boiler room at Shaftesbury House

Calorifiers supply hot water and steam for laundry, cooking, sterilizing, central heating, and other domestic uses. Some 17,000 gall. of gas-heated water is pumped every hour by three electric pumps and one steam pump. The hot water calorifiers have a capacity of 500 gall. each and the steam calorifiers shown in the foreground contain 1,000 gall. All the calorifiers are gas-heated and electrically driven. The central heating and hot water systems are adjusted by thermostatic valves.

Gas Home Service



A section of the Darwen Gas Department's recent "Gas Home Service" Exhibition. The large hall at the Public Baths was divided into several smaller rooms, in one of which gas fires were shown fitted into modern surrounds.

Gas Undertakings' Results

Caldicot and District Gas Light and Coke Company.—A final dividend of 5%, making 10% for the year, was declared at the annual meeting in London on Dec. 4. The revenue account for the year ended June 30 showed a profit of £3,780, and the balance carried forward was £1,858, an increase of £281 over the amount brought in. Gas sales totalled 32,059,400 cu.ft.

Chepstow Gas Company.—A revenue profit of £3,156 for the year ended June 30 was reported at the annual meeting in London on Dec. 4 at which a dividend of 5% was declared, leaving £1,876 to be carried forward, against £1,785 brought in. Gas sales for the year amounted to 311,227 therms.

Oswaldtwistle Gas Department.—The annual report shows a net profit of £2,802. Coal cost £32,575, an increase of £395, and wages £2,122 (the ninth general increase since the war). Rates increased by £124. These increases were set by the record sale of gas and appliances, plus the higher price obtained for by-products. Plant was working at full capacity. Despite increased costs during the last seven years, the price of gas had risen by only 0.7d. per therm. A debt of £13,150 on the undertaking would have been wiped out but for contributions to the rates.

German Information

In a joint statement, Sir Stafford Cripps, President of the Board of Trade, and Mr. W. A. Harriman, United States Secretary for Commerce, have announced additional arrangements for the exchange of German technical information acquired by the two nations since VE Day. These arrangements are complementary to those already in force whereby reports on German industry and technical developments, prepared by British and American investigators respectively, are made available to the industrialists of both countries.

Important German scientific and technical documents have been uncovered by British and American investigators in their respective zones, and microfilm copies have been made. The exchange of these documents between the two nations has been imperfect; but under the present agreement representatives of each nation will be able to select from each other's storehouse of reports the items which its finds valuable. Copies will be obtained on an exchange basis.

The American depository for German documents and microfilms is the Office of Technical Services, Department of Commerce. Three British experts are now examining the catalogues and abstracts of these reports which have been prepared by O.T.S., and the Department of Commerce has agreed to provide microfilm copies of all items chosen by the screeners.

In London, the main processing centre for German documents is the Board of Trade, German Division (Documents Unit), at Lansdowne House. There documents of interest to industry are summarized and copies of the abstracts sent to the O.T.S. staff which is now at work in Frankfurt, Germany. Microfilm copies of all documents desired by the O.T.S. experts will be supplied by the Board of Trade.

Modern Vehicle Design

The Sheffield and District Gas Company, which is one of the largest company-owned public utilities in the country, operates a fleet of 70 commercial vehicles and 33 private cars. The vehicle, illustrated, which has just taken the road, strikes a modern note in tank vehicle design. This is the first of three tanks to be built on Morris chassis type L.C. 16 h.p. and the tank and valencing was completed to the design of the Transport and Mechanical Superintendent. The tank, which was fitted by W. P. Butterfield, Ltd., of Shipley, is of 240 gall. capacity, fabricated from mild steel. The valencing was executed by Marston Excelsior, Ltd., Norton Works, Meadowhead, Sheffield; again the construction being in mild steel with angle frame covered with "Alclad" sheets.

Sheffield's new streamlined Tank Vehicle

Some of the salient features in connexion with the vehicle are a locker door at the front near side, which allows entry for the operation of a semi-rotary pump which is attached to the chassis, and provides for direct entry to the front of the tank. A hose reel is also mounted to the chassis and allows for the carrying of 25 ft. of hose pipe. The spare wheel is mounted behind the cab on brackets which are bolted to the chassis, and access to this and the filling of the petrol tank is again by a locker door on the front offside. A spacious locker is provided at the rear for the carrying of equipment required in connexion with the syphoning of liquor from the 1,400 miles of gas mains, serving an area of 328 square miles stretching from Barnsley to Matlock.

The vehicle conforms to the standard colour scheme for commercial vehicles operated by the Company and is finished in blue-grey with black mudwings and lettering in yellow, shaded blue.

Helping Housewives

Assistance for housewives faced with the problem of making a Christmas cake was provided at the first of a series of post-war cookery demonstrations held at the Barnsley showrooms of the Sheffield and District Gas Company.

Gas-Works Routine and Coal Conservation*

By D. B. LAWS
Sunderland Gas Company

BETWEEN the two World Wars when coal was plentiful and plant readily obtainable, the major problem of the technical personnel of the Gas Industry was to popularize the use of gas and the success which attended their efforts may be partly gauged by the fact that many undertakings now find their equipment inadequate.

This shortage, together with that of coal, has produced an interesting parallel between 1920 and 1946, viz., a reduction in the extraction of crude benzole and an increased use of carburetted water gas. It is to be hoped that when an ample supply of coal is again available the complete extraction of benzole will be resumed, for there can be little doubt that a maximum annual production of perhaps 40 million gall. of this spirit is a useful item in the national economy and the improvement in the finished gas scarcely needs repeating.

With regard to the manufacture of carburetted water gas, especially on the smaller works, there are two points which seem often to receive too little attention: (*a*) the available steam supply, and (*b*) relief holder capacity.

Steam Supply

Bearing in mind the relatively high cost per therm of carburetted water gas and the fact that insufficient steam may frequently reduce the output by as much as 10%, it would seem that the provision of an extra boiler might be justified; the cost of such a boiler compared with that of the plant would not be great. A method sometimes adopted to overcome this shortage of steam is to arrange for one blower to be electrically driven by current taken from the town supply. The inherent danger of this is that, in severe weather when the plant is most needed, the supply of electricity is sometimes liable to fail and it may be almost impossible to operate the steam-driven blower because of abnormal steam demands for other sections of the works. Where a small mechanically operated plant is working with little supervision the unobserved stopping of an electrically driven blower might have serious consequences. Where a carburetted water gas plant is intended to form a permanent part of the manufacturing equipment, and not for use only in emergencies, it should be provided with a waste heat boiler. Dr. Dent, in his report presented at the 4th Autumn Research Meeting of the Institution of Gas Engineers, indicated that when producing a gas of 460 B.Th.U. per cu ft. the introduction of such a boiler increased the overall thermal efficiency of the plant by 8%. Furthermore, in 1922 tests were carried out on behalf of the Institution of Gas Engineers at the Windsor Street works of the Birmingham Corporation Gas Department, when it was shown that a waste heat boiler could generate all the steam required for the plant, including blowers, exhausters, &c., and provide a small surplus.

Relief Holders

It is by no means an uncommon practice when installing a carburetted water gas plant to use as a relief holder one that is of considerable age and having a capacity too small in relation to the output of plant. This may result in the plant having to operate for intermittent periods throughout the day, thereby reducing its efficiency, disorganizing the conduct of the works, and rendering a constant admixture of water gas very difficult.

In view of the unprecedented shortage of coal and coke brief reference may be made to three simple, but important, points in connexion with the operation of smaller horizontal retort plants, a number of which are still to be found.

(*a*) *Quenching of Coke.* Where this is partly carried out inside the retort house by the spraying or throwing of water, in order to prevent serious damage more care is often necessary to ensure that such water does not come into contact with the settings and all the ironwork connected therewith. The ill effects of damaged retort ends and loose or defective mouthpieces are well known, but it is worth repeating that Mr. Hollings, in a Paper presented at the Annual Meeting of the Institution of Gas Engineers in 1928, pointed out that "with horizontal retorts a serious loss up to 10% of the thermal yield might occur, particularly during the early stages of carbonization."

(*b*) *Recovery of Coke from Producer Ashes.* The percentage of coke in the material removed from producer ash pans varies considerably at different works and figures between 15% and 45% have been published. At works which cannot support an ash washing plant it should be possible to recover the coke by hand at an approximate cost of £1 per ton, the job providing suitable employment for men no longer capable of arduous work. Opinion regarding the use of ash washing plants appears to be somewhat divided, but there is no justification for allowing coke to be removed under the classification of rubbish. From a works carbonizing say 10,000 tons of coal per annum the coke in the pan ash might well amount to about 200 tons.

(*c*) *Carbonizing Costs.* Excluding capital charges, the costs incurred in operating a horizontal retort plant have been given by an eminent authority as :

Coal	68%
Coke to producers	13%
Renewals	9%
Wages	6%
Power and incidentals	4%

For the benefit of those in charge of similar installations it is felt that the mere repetition of these figures will provide a ready means of maintaining a correct perspective when striving for economy and increased efficiency.

Cyanogen Removal from Horizontal Retort Gas

The recovery of cyanogen has never been universally adopted by the Gas Industry, the principal reason being the small amount present, which in gas from horizontal retorts or coke ovens is only equivalent to about 5 lb. of prussiate of soda per ton of coal carbonized, and from vertical retort gas about half this quantity.

Owing to its serious effect upon the efficiency of the oxide purification process and on all the iron and steel work with which the gas thereafter comes in contact, it is suggested that under "certain present day conditions" the hydrocyanic acid could be removed as an impurity without great expense, by the adoption of the Williams' process. The requisite conditions for the introduction of the process are: (1) completely tar-free gas; (2) an available margin of 3 in. to 4 in. back pressure; (3) a supply of hard spent oxide containing 50% sulphur; (4) a supply of water or weak ammonia liquor at 40 to 50 lb. per sq. in. pressure.

As the electrical precipitation of tar is now almost standard practice and many undertakings are contemplating purifier extensions it would only be necessary (1) to increase slightly the size of such extensions, thereby liberating say two of the existing boxes to act as cyanogen extractors; or (2) to refrain from disposing of existing boxes if such a procedure was contemplated. With regard to the size of the cyanogen extractors, it has been found that two boxes each 20 ft. square by 5 ft. deep and containing a layer of oxide 2 ft. thick were sufficient to remove the HCN from 3 million cu.ft. of gas per day. A small works producing ½ million cu.ft. per day might be able to erect a cheap extraction plant by purchasing from a large works, a disused Livesey washer, capable of passing 3 million cu.ft. per day. The cyanide liquor could be treated in a sulphate of ammonia plant or sent to the storage wells for disposal. An efficiency of over 90% is claimed for the process, but if it could be worked at even 75% the resulting benefit would be very considerable.

If evidence of the effect of cyanogen is desired, tests have shown that gas during its passage through the purifiers had its HCN content reduced from 50 grains per 100 cu.ft. to 5 grains, and the resulting spent oxide was found to contain 5% to 6% of prussian blue. Analyses of deposits from a station meter, a C.1 main and service pipes revealed prussian blue content varying from 31% to 17%.

It will possibly be thought that the scheme outlined above is an unnecessary refinement, but having recently seen, at a works operating continuous vertical retorts and electrical precipitation of tar, a parcel of spent oxide containing 65% of sulphur, one is constrained to think that the subject is at least worthy of consideration.

Smoke Abatement and Coal Conservation

The war just ended, by creating a shortage of coal and an increased demand for gas for industrial purposes, has helped to reduce the smoke pall over industrial districts; much still requires to be done, and only a very few of the aspects of the problem are here mentioned.

In the district covered by this Association there are a number of coal loading seaports, the dockside areas of which produce a considerable amout of atmospheric pollution. Bearing in mind the fact that, in 1863 96% of the fuel used by one railway company was coke, there would seem to be no reason why small shunting locomotives and even river craft should not operate on this fuel, as in neither case is it necessary to store a large weight of fuel or to steam on full load for extended periods.

In this country in 1944 27 million tons of coal were used by a variety of what might be termed the "lighter" industries, associated with which there must be a large number of small steam-raising plants which, with certain modifications, could utilize coke or breeze in place of coal. In the same year 3.4 million tons of coal were used by non-industrial undertakings which include hospitals and sanatoria; it is difficult to understand why local authorities—directed by the Public Health Act, 1936—often permit black smoke to be emitted by the boiler plants at such institutions which are frequently under their own jurisdiction. The question at once arises, if coke and breeze is to replace some of this coal—often of the duff variety—can supplies

* From a Paper to the North of England Gas Managers' Association (Auxiliary Section), Dec. 13, 1946.

be made available? Without attempting to go into actual figures, it would appear that, if and when, adequate coal supplies and new carbonizing plant are obtainable, and the manufacture of carburetted water gas is reduced to its pre-1939 level, the Gas Industry will be in a position to supply a much greater quantity of solid smokeless fuel than ever before. No doubt the substitution of coke or breeze for coal might arouse some opposition from factory owners and boiler attendants, but surely if the importance of the problem was fully appreciated, the willing co-operation of all would be forthcoming.

According to the statistics of the Ministry of Fuel and Power, in Durham County during 1945 882,000 tons of coal were distributed to colliery workers and 559,000 tons used at and around the mines. If all this coal could be carbonized under gas-works conditions it should yield *inter alia* approximately 20,000 million cu.ft. of gas and 700,000 tons of saleable coke and breeze. Allowing for the steadily increasing electrification of the mines, this coke and breeze should provide all the solid fuel required for steam raising, and almost 3 tons for every one of the 70,000 workers, in receipt of coal allowance. If in place of coal these workers also received 85,000 cu.ft. of gas per annum, there would be a surplus of approximately 14,000 million cu.ft., or more than is presently consumed in the whole of the county, excluding that used for heating coke ovens. Unless this gas was required for any new industrial projects it could be used for the generation of electricity, thereby displacing approximately 230,000 tons of coal.

It is doubtful whether such a utopian scheme will ever be carried out, and the reaction of the recipients to their changed forms of fuel might create a serious problem, but this example from one coalfield may serve to indicate what could be accomplished in the cause of smoke abatement and coal conservation.

The Fischer-Tropsch Process—Present and Future*

By C. C. HALL, Ph.D., M.Sc., F.R.I.C.
Fuel Research Station

(A "GAS JOURNAL" Abstract)

THIS Paper is based on data mainly collected from German sources by Allied investigators operating under the C.I.O.S. and B.I.O.S. organizations, sponsored by the Ministry of Fuel and Power and under the direction of Dr. A. Parker, Director of Fuel Research. The method of operation of German plants is summarized with estimates of their performance, efficiency, and costs and an account of the utilization of the several products.

The Fischer-Tropsch process is based on the discovery that "a mixture of carbon monoxide and hydrogen would react in the presence of iron, cobalt, or nickel catalysts at temperatures in the range of 180° to 250°C. and at atmospheric pressure to form a mixture of aliphatic hydrocarbons ranging from methane to solid waxes and including substantial fractions boiling in the motor spirit and diesel oil range." The "synthesis gas" (I of CO to 2 of H_2) is prepared either from water gas or coke oven gas, the former giving the least trouble, the latter being cheaper where available. The total sulphur content must be reduced to small proportions if catalyst poisoning is to be avoided. The method used is, first, the removal of H_2S by iron oxide in the usual way, followed by three stages of treatment at 180° to 250°C. over granules of 70 parts iron oxide to 30 parts sodium carbonate, by which sulphur content is reduced to 0.02-0.06 gr./100 cu.ft.

The catalyst used in all the German plants from 1938 was a mixture by weight of 100 parts cobalt, 5 thorium oxide, 8 magnesium oxide, and 200 kieselguhr, granulated to 1 to 3 mm. and "reduced in a rapid stream of pure, dry ammonia-synthesis gas ($H_2/N_2=75/25$) for a short period at about 400°C." The period of use was 3 to 8 months, after which it was discarded, the cobalt and thorium being recovered and used in the preparation of fresh catalyst.

The synthesis reaction is strongly exothermic (about 70 B.Th.U./cu.ft. of gas) and to obtain the desired products and avoid excessive production of methane and carbon the temperature must be rigidly controlled, the apparatus for which is complicated and expensive.

Nine plants are listed, five working at atmospheric pressure, two at medium pressure, and two at both. The average composition of the reaction products are tabulated. The lightest, gaseous, fraction known as "Gasol," was liquefied by compression and sold as fuel. Spirit, 30°-165°C., was sold for blending with benzole; the light middle oil, 165°-230°C., for upgrading low-quality diesel oil. The heavy middle-oil, 230°-320°C., known as "Kogasin," was nearly all sold to I.G., who hydrogenated it for use in the preparation of washing powders. The soft wax, 320°-460°C., went to the production of fatty acids, and the hard wax was sold to wax refiners and blenders.

The thermal balance shows that in the most efficient plant, that at Bergkamen, 55.6% of the heat input was recovered in the form of primary products, residual gas, and steam, requiring 4.5 tons of coal per ton of primary products.

Costs are analyzed in German currency. In the attempt to assess the values in British currency it is shown that there might be a deficit of £7.3 in revenue per ton of primary products. "The conclusion, therefore, is that the operation of the Fischer-Tropsch process in this country on the tried and proved German lines would not be an economic proposition."

Possibilities for the future depend first on a drastic reduction in the cost of synthesis gas. The synthesis process would need to be improved "either in the direction of increased space-time yield" or by the products of substances of more value. We in Great Britain are at a disadvantage in the cost of synthesis gas. In the U.S.A. cheap natural gas is available as well as cheap sub-bituminous coal, and the latter is available in several parts of the British Commonwealth. For this country the hopes of obtaining cheap synthesis gas are not bright. The Germans made very little progress in increasing the efficiency of the process. They did something with catalysts, but this is unlikely to have a material effect on costs. "The most costly feature of the German process is the number of complicated reaction vessels required for a given number of products."

The position is summed up as follows:—

"The operation of the Fischer-Tropsch process in this country, based on the performance of the most efficient German plants, would be uneconomic. This is mainly due to the high cost of synthesis gas, but partly to the inefficiency of the synthesis process itself and partly to the fact that a high proportion of the product is only utilizable as liquid fuel.

"Even with the application of all foreseeable improvements in synthesis gas manufacture and synthesis process technique there seems little prospect of utilizing the Fischer-Tropsch method for the economic production of liquid fuels in this country. If, however, the process is operated along the lines of German research and development work to produce the maximum possible amount of high-priced chemical and special products, a limited industrial application of the process might prove to be economic. If, in addition, some reduction can be effected in the cost of synthesis gas, and American claims for improved efficiency in the synthesis process prove to be justified and are not restricted to production of petrol as the main product, then the process has an attractive future as a source of aliphatic chemical products. The prospect is at least sufficiently encouraging to justify continued research on the process and products up to and including pilot-plant operation."

* Paper to the Institute of Fuel (Yorkshire Section)

The Association of British Chemical Manufacturers has been fortunate in securing permanent offices for its branch office in Bombay. The address is Janmabhoomi Chambers, Fort Street, Ballard Estate, Bombay, 1, India. (Tel.: Bombay 30457. Telegraphic address: Manuchem, Bombay.)

Measurement of Temperatures in Gas Retorts*

Records at Selected Positions in or Near to the Retort Wall

By E. HEATON, Ph.D., A.R.I.C., and
A. T. GREEN, O.B.E., F.R.I.C.

IT is perhaps surprising that, in a chemical operation such as the carbonization of coal, information on the temperature of the carbonizing surface at different positions of continuous or intermittent retorts should be so meagre. Control of the process is probably effectively carried out by temperature measurements at selected positions in the flues, but this is inadequate when the problem of improving the durability of the refractories of construction is tackled. For this purpose more data are essential on the temperature of the brickwork surface in the retort proper. It is here that the most stringent conditions, if not of temperature, at least of temperature variation, are encountered and it is here, too, that slagging and erosion are most severe. These conditions must be evaluated in order that the refractories can be properly selected. How otherwise can the accumulated data on thermal properties on slag systems be applied if the temperature at the carbonizing surface is not defined? Considerations such as these led to the temperature surveys here described.

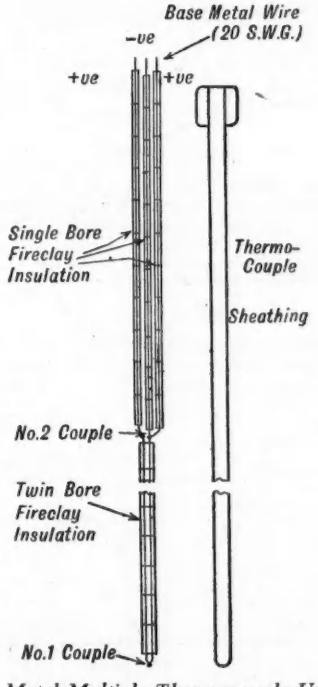


FIG. 1.—*Base-Metal Multiple Thermocouple Unit and Sheath for the Measurement of the Temperature in the Charge.*

Attempts have been made to estimate the temperature in the charge by means of tallies. These only indicate the maximum temperature to which they have been subjected and hence give little indication of the temperature distribution. In certain undertakings the temperature in the charge and gas offtake has been measured in order to check efficiency of stoking. Thus no accurate knowledge of the conditions of temperature obtaining on the carbonizing face of the refractory is available.

The temperature of the surface of the brickwork will depend upon a number of factors, the main ones being the temperature of the flue and the temperature and behaviour of the charge. The first and third sections of this Paper are designed to obtain information on the temperature of the charge close to the refractory in horizontal and continuous vertical retorts, and the second section deals with the measurement of temperature in the brickwork of a continuous vertical retort.

Measurement of Temperature in the Charge of a Continuous Vertical Retort

The apparatus was simple, consisting of base-metal thermocouples in units of two with a common negative lead, insulated with fireclay sheathing and enclosed in an iron sheath made of $\frac{5}{16}$ in. gas tubing (Fig. 1). The diameter of the wire was 20 s.w.g. This was a compromise as it was desired that this sheath and the couple wire should be of small diameter in order that the junction should be as near as possible to the retort wall and that the life should be as long as possible. Even with this gauge, however, the junction was about $\frac{1}{2}$ in. from the wall and the maximum life was only seven days. It was found advisable to change the couples every five days to avoid the risk of a breakage leaving part of the couple in the sheath.

The sheath was inserted in the charge through a hole drilled in the top casting (Fig. 2) and kept as close to the wall as possible by means of a hook-bolt attached to the bottom of

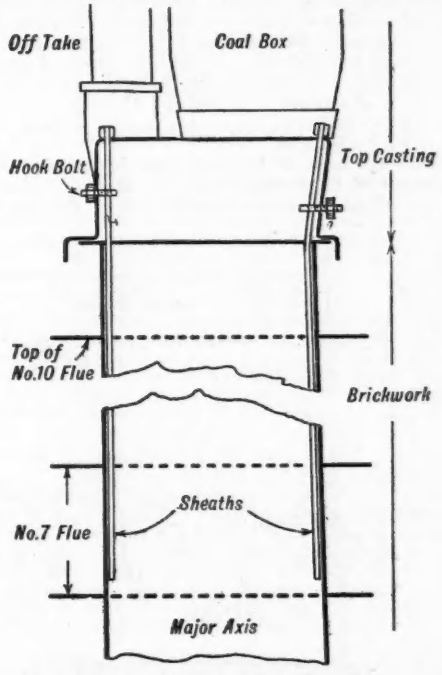


FIG. 2.—*Sketch of Retort and Top Casting, Showing Position of Sheaths in the Charge in Relationship to the Retort Walls.*

the casting. No satisfactory means was found to keep the tube close to the wall below the casting, and the charge tended to work behind it. Hence the temperature was measured in a zone $\frac{1}{2}$ to 3 in. distant from the refractory. The sheaths were placed at the ends of the major axis.

A continuous record was made on a recording galvanometer, the leads between the head of the thermocouple unit and the recorder being of the same wire as the thermocouple. Connexion was made by means of porcelain-insulated wire connectors. A $\frac{5}{16}$ in. gas tube union was fitted to the top of the sheath in order to prevent it from slipping accidentally into the retort when inserted. This was done at the end of scurfing, immediately prior to filling with coke.

* From the 37th Report of the Refractory Materials Joint Committee : 1945-46.

Various lengths of couples and sheathing, from 7 to 15 ft., were used. It was found, however, that about 10 ft. was the maximum length which could be satisfactorily manipulated. Temperatures could be measured at different heights during a survey by varying the distance between the junctions or the distance the couple unit was inserted into the sheath.

Discussion of Results

The work on temperature distribution was started as the result of some readings taken with a base-metal thermocouple inserted approximately 6 in. into the top of the charge in a continuous vertical retort, using a non-recording galvanometer. This showed a drop in temperature of some hundreds of degrees over a period of an hour immediately following rodding. It was considered that if this temperature change was a typical feature it was a factor which might adversely affect the refractory material. Hence a number of surveys were conducted to test this and to ascertain the temperature conditions in the top of the retort.

The results finally obtained confirmed the original observations and were found to depend upon a number of variables, *viz*:—

(1) The position of the couple in the charge.
(2) The type of coal carbonized.
(3) The efficiency of rodding.
(4) The temperature of working.

As it was not found possible to control these factors, it was impossible to obtain reproducible results for different surveys. Each survey had to be considered individually, and only conclusions on the general tendencies could be drawn.

Attempts were made to assess the "sticking" of the retort by asking the stoker to make a chalk mark on a board every time this occurred. No correlation was obtained between these observations and the temperature drops recorded by the galvanometer. It was found, however, that comparing retorts with and without the inserted thermocouple sheath, the effect of the sheath in the charge was to increase the tendency to "stick" by about 50%.

Fig. 3 gives instances of the temperature variations occurring on the non-offtake and offtake ends of the major axis in one day. They represent rather extreme cases. On the offtake

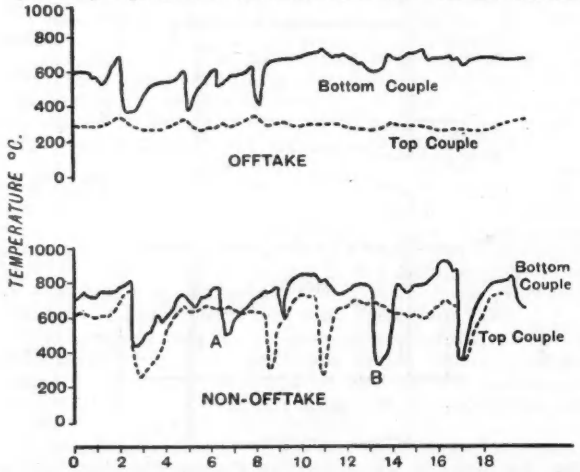


FIG. 3.—*Recordings over 18 hr. Measured under the Gas Offtake and on the Opposite End of the Major Axis (non-offtake).*

The average temperature variations are rather more severe than indicated under the offtake and less severe at the opposite end. The positions A and B on the curves for the non-offtake end indicate when the temperature of the couple opposite No. 10 flue falls, while that 18 in. higher remains steady due to the formation of a crust or sticky mass of coal.

end the fluctuations tended to be more severe on an average, and on the non-offtake less severe than the figures indicate. There was a tendency, however to some such difference.

Figs. 4 and 5, and Figs. 6 and 7 give the average daily temperatures for these surveys (non-offtake and offtake, respectively). Fig. 3 (non-offtake) gives a detailed record on the 15th day, while Fig. 3 (offtake) gives particulars of the temperature on the 35th day.

Figs. 6 and 7 represent a far longer period of time than Figs. 4 and 5, and the opportunity was taken to vary the position of the couples from 5 or 6 ft. below the top of the refractory to 8 in. above the refractory. Over this range

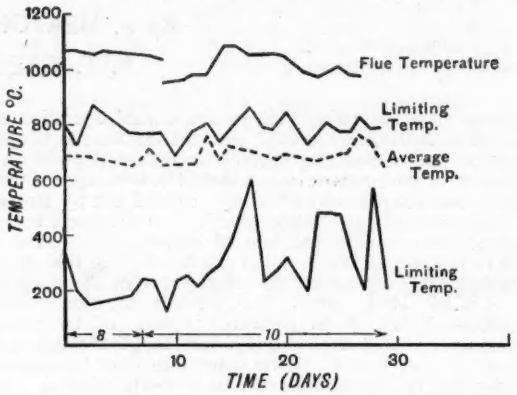


FIG. 4.—*Average Daily Temperature and Limiting Temperature for a Survey Conducted at the Non-offtake End of the Major Axis, the Thermocouples Being 6 ft. (No. 8 flue) and 2 ft. (No. 10 flue) Down the Retort.*

The Flue Temperatures are measured by an Optical Pyrometer.

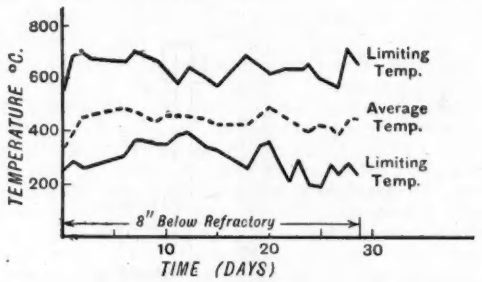


FIG. 5.—*Average Daily Temperatures and Limiting Temperatures Similar to Fig. 4, Measured 8 in. Below the Top of the Retort.*

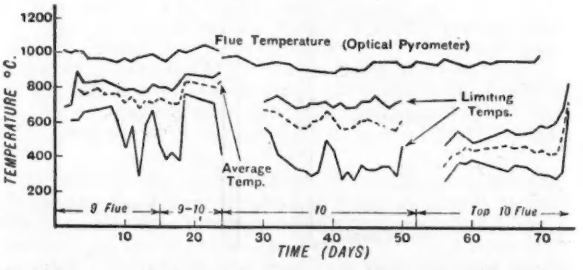


FIG. 6.—*Average Daily Temperatures and Limiting Temperatures for a Survey Conducted under the Gas Offtake at 1 ft., 2 ft., 3 ft. and 4 ft. From the Top of the Retort.*

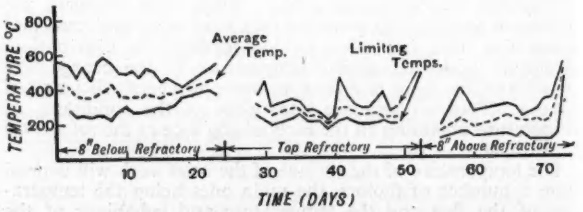


FIG. 7.—*Average Daily Temperatures and Limiting Temperatures Similar to Figure 22, Measured 8 in. Below the Top of the Retort, the Top of the Retort, and 8 in. Above the Refractory in the Casting.*

the temperature changed considerably, though when the gas space was reached the temperature became steadier. The day-to-day average temperature varied by over 100°C. at any level, while the limiting temperatures were approximately 300° and 900°C.

In the case of Figs. 4 and 5, where the temperature was measured at the non-offtake end of the major axis, the minimum temperature was rather lower, being 100°C. for No. 8 flue. However, the couple 10 in. below the refractory had a higher minimum temperature (190°C.). This may have been due to the formation of a sticky mass of coal in this zone which was not generally cleared by rodding and would act, to some extent, as a protection against larger temperature variations. Evidence of this is given in Fig. 3 (non-offtake), where the temperature of the lower couple suddenly drops, while the top couple remains steady (positions A and B, Fig. 3).

Steadier conditions on the offtake side, however, may possibly have been due to the greater attention paid to this side when rodding. This would result in a crust forming rarely under the gas offtake and there would also be less tendency for the uncarbonized charge to come into contact with the refractory.

If the limiting average temperatures are plotted at each level (as in Fig. 8) a recognizable curve is obtained using the results from one survey. This is done for survey No. 4 in Fig. 8 on the off-take side. The addition of another survey (No. 5) results in some confusion, while if the results of a number of surveys are added together and plotted, as for the non-offtake side, the zone of temperature at any level is considerably widened. As indicated earlier, this is due to the large number of variables involved.

Conclusions

It is not possible to say that at any level the temperature of the charge in contact with the refractory was a certain figure. For instance, in the middle of No. 9 flue the maximum and minimum temperatures on both the offtake and non-offtake ends of the major axis were very occasionally as

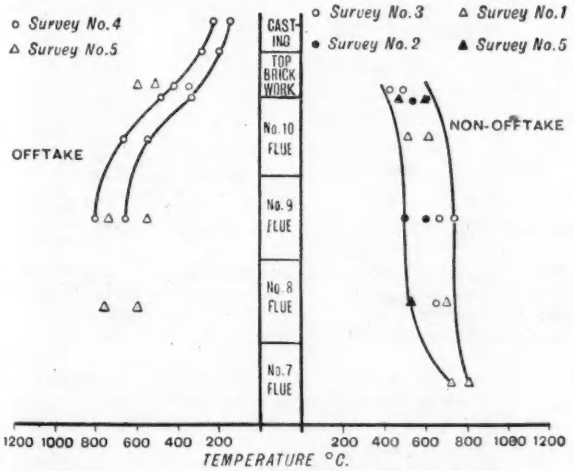


FIG. 8.—*Temperature Distribution in the Charge Close to the Retort Wall.*

The maximum average daily temperature and the minimum average daily temperatures only are plotted.

The limiting temperatures are between 100° C. and 800° to 900°C. depending upon the distance from the top of the retort.

diverse as 900° and 100°C. The average daily temperature varied by 100°C. The main conclusions are therefore:—

(1) Considerable temperature fluctuations occurred in the charge of a continuous vertical retort, in contact with the refractory, which amounted to between 400° and 500°C. over periods of about an hour.
(2) This fluctuation was irregular, drop in temperature occurring after rodding. When carbonizing a difficult coal sticking of the charge was observed every time the retort was rodded.
(3) Temperature conditions were steadier on the offtake end of the major axis than at the non-offtake end. This was attributed to the extra attention which was given to the offtake in an endeavour to prevent the formation of a crust.
(4) A crust or sticky mass of coal formed at the non-offtake end, which was not always removed by rodding. This prevented the temperature, as registered by the thermo-couple in this zone, from falling and might also have tended to make the charge stick if it was neglected too long.

(To be continued)

Whessoe Programme for 1947

Developments during the year just ended foreshadow the programme of work which Whessoe, Ltd., has in prospect for 1947. The feature of the past year has been the number of important contracts received for the complete cooling and purification of new gas streams. This policy enables gas undertakings to unload the responsibility of planning the supply of plant and the manufacture and installation of all units, on to one firm, thereby allowing construction to be scheduled from start to completion and ensuring that each unit is designed for the operating conditions, while such ancillary services as cooling water, steam, liquor and tar circuits are designed to conform with the complete layouts in respect of flows, temperatures, storage capacity, pumps, &c.

The first of these comprehensive contracts was announced last year—plant for a complete by-product coke oven gas stream for the Gas Light and Coke Company, ordered through the Woodall-Duckham Company. This plant is now in course of erection. Also being erected is a complete unit for the South Metropolitan Gas Company, for 96 million cu.ft. per day of horizontal retort gas at the Rotherhithe station. This contract includes primary and secondary condensers, electro-detarrers and static washers, all of the Whessoe type and of special design for the site conditions.

East Greenwich Extension

Probably the largest single extension of plant ever executed has also been placed by the South Metropolitan Gas Company with Whessoe, Ltd. It is for the complete cooling and wet purification of 31 million cu.ft. of coke oven gas per day at East Greenwich. This in general has been designed for two separate streams, each with the appropriate number of gas coolers (primary and secondary), exhausters, electro-detarrers and static scrubbers, with additional units acting as common spares for both streams.

Another 1946 order for complete plant is for the Nottingham Gas Department and Whessoe, Ltd., will be supplying to the order of the Woodall-Duckham Company plant comprising Whessoe high efficiency vertical water tube condensers, a W. W.-D. electro-detarrer, a Livesey washer, and a Whessoe multi-stage static ammonia scrubber, with liquor cooler, all for four to five million cu.ft. per day of vertical retort gas.

During 1946 the number of W. W.-D. electro-detarrer orders has reached a record, and many of these units will be put into service during 1947, making the total over 150 separate electro-detarrer installations. Further orders have been received for Whessoe multi-stage static scrubbers, and it is noticeable that a number of Whessoe vertical tube multi-pass condensers, despite their relatively low water consumption, are being installed with ancillary water coolers to provide self-contained installations for gas cooling. The trend in purifier design is towards welded steel, deep box construction and Whessoe, Ltd., has more work of this type in hand this year.

High Pressure Distribution

In the field of high pressure distribution, developments are again rapid and an increasing number of pressure holders are being installed. Hydraulic testing is now the recommended practice and welded construction is an established technique, both for field erected plant and for the most recent practice of smaller extra-high pressure shop-welded vessels. In the latter category Whessoe have an order in hand from the Mid-Kent Gas Light Company for three vessels, each of 30,000 cu.ft. releaseable gas capacity operating at 200 lb. per sq. in., which will be stress relieved and radiographed before delivery. In the field-welded category are contracts for vessels of up to 188,000 cu.ft. releaseable capacity, 30 ft. diameter by 88 ft. long, the size of one holder now in course of manufacture for the East Wight Gas Company.

These activities at home are additional to and in no way supersede the Company's export work. The year 1946 was one of solid advancement in the export field, and the volume of work in course of manufacture and programmed for 1947 promises to provide an extensive contribution to Britain's export trade.

Quartz in Fireclay Refractories*

By J. SHARP SMITH, B.Sc., D.I.C., A.M.I.Chem.E., and PETER F. F. CLEPHANE, M.Sc.
(Gas Light and Coke Company)

(*Continued from p.* 94)

MATERIAL "B" was semi-silica composed of fireclay artificially "laced" with quartz. The intrinsic refractoriness of the clay was probably higher than that of the clay material "A."

Heating at 1,000°C. caused little, if any, change in the appearance of thin sections of the material. At 1,200°C. there was a definite disappearance of quartz, and glass appeared in considerable amount after heating for 16 days. The proportion of cavities rose to a maximum and fell with continued heating as in the case of material "A." Heating at 1,300°C. produced similar results to those obtained at 1,200°C., but in about one-half the time. At 1,400°C. the reaction was well established after 6 hr., and after 24 hr. the amount of matrix which had definitely changed to glass was quite considerable: at this stage about one-third of the area of the section was glass.

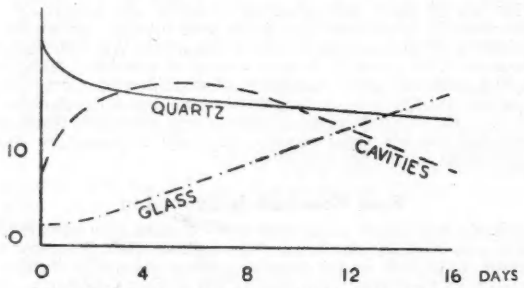


FIG. 3A.—*Changes in Material "B" at 1,200°C.*

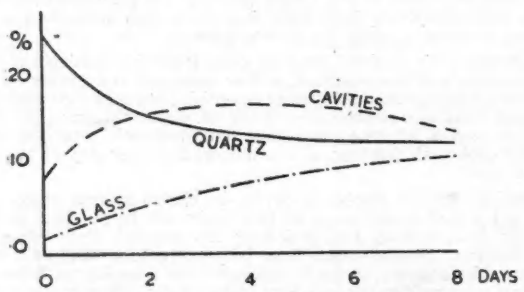


FIG. 3B.—*Changes in Material "B" at 1,300°C.*

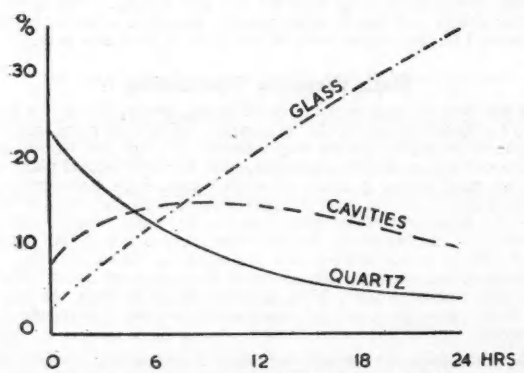


FIG. 3C.—*Changes in Material "B" at 1,400°C.*

* Paper presented to the Institution of Gas Engineers—Communication No. 305.

The analyses of the thin sections are given in Table 4 and Figures 3a to 3c. The true specific gravity of the material fell during the heat treatment at 1,400°C.; Fig. 4 shows the change graphically.

TABLE 4.—*Heat Treatment of Material "B"*

Temperature	Duration	Matrix (%)	Quartz (%)	Cristobalite (%)	Glass (%)	Cavities (%)
As received...		64	24	1	3	8
1,000°C. ...	28 days	67	21	2	2	8
1,200°C. ...	12 hr.	65	21	2	1	11
	1 day	54	19	3	7	17
	2 days	62	19	3	2	14
	8 days	55	17	1	9	18
	16 days	56	15	2	18	9
1,300°C. ...	6 hr.	63	23	1	1	12
	12 hr.	52	25	3	2	18
	1 day	67	19	2	4	8
	2 days	64	14	4	5	13
	4 days	63	15	5	11	6
	8 days	60	13	3	9	15
1,400°C. ...	2 hr.	62	19	1	6	12
	6 hr.	64	14	3	13	6
	12 hr.	58	7	0	21	14
	24 hr.	36	7	11	36	10

The results obtained in the G.L.C.C. refractoriness test are shown in Fig. 5. The duration of the test was extended for 24 hr. and observations taken half-hourly. The progressive shrinkage is characteristic. Evidence of gross shrinkage at

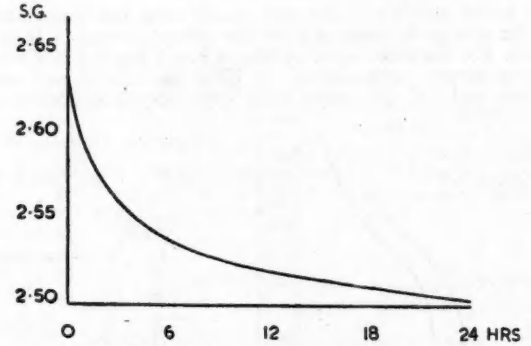


FIG. 4.—*Change in True Specific Gravity of Material "B" at 1,400°C.*

1,410°C. is also afforded by the results of the I.G.E. permanent linear change test. Nine test pieces were subjected to the test: the average shrinkage was 2·22%, the maximum being 3·61% and the minimum 0·66%.

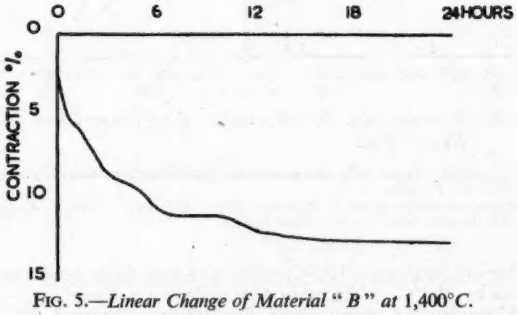


FIG. 5.—*Linear Change of Material "B" at 1,400°C.*

Plates 5 and 6 are composite photomicrographs of the material before the experimental heat treatment and after 24 hr. at 1,400°C., respectively. The heterogeneous character of the material is particularly well shown in Plate 5 and the extensive formation of glass and mullite in Plate 6.

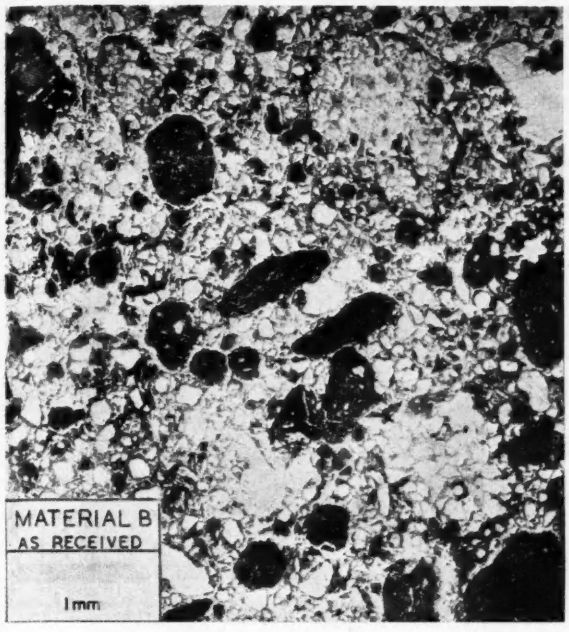


PLATE 5.—*Material " B " as Received*

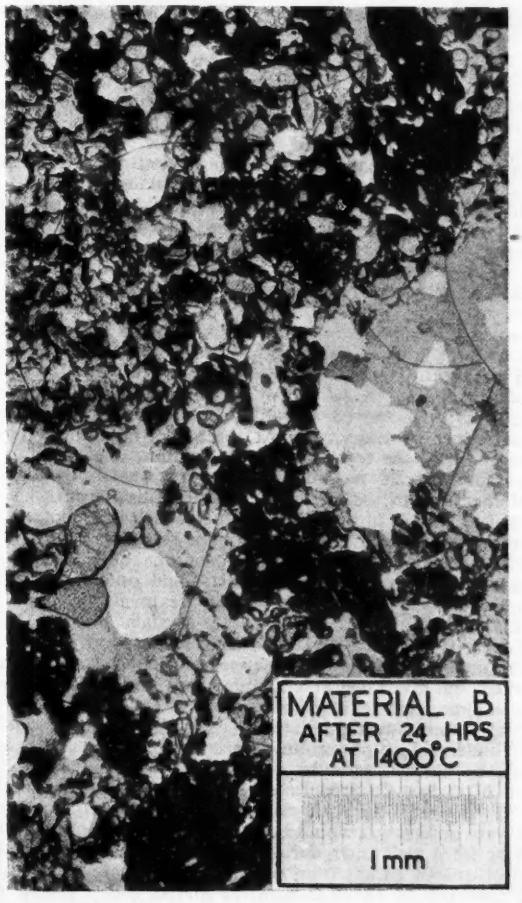


PLATE 6.—*Material " B " after 24 hr. at 1,400° C.*

The analysis of material " B " was:—

	%
SiO_2	76·0
Al_2O_3	17·0
Fe_2O_3	4·2
TiO_2	0·9
CaO	0·3
MgO	0·6
Alkalis	0·9

Material " C "

This material was a naturally occurring clay-bonded silica. Some of the quartz in this material consisted of macroscopic grains held in the general matrix of the brick. It is worthy of note that in use at 1,350° to 1,400°C. this material is well known to give very satisfactory service and to exhibit characteristics peculiar to itself and a few similar products: in particular, the conversion of the quartz is exceedingly slow, the material coming from the kilns showing very little conversion and material from settings dismantled after several years life showing only a portion of the quartz changed to cristobalite or tridymite.

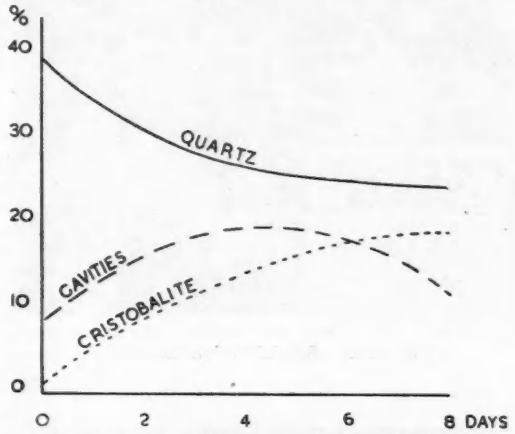


FIG. 6A.—*Changes in Material " C " at 1,300°C.*

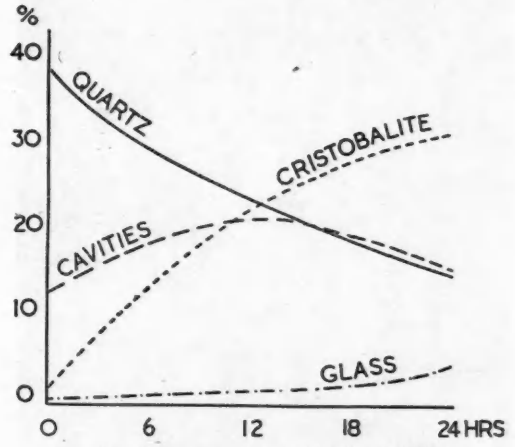


FIG. 6B.—*Changes in Material " C " at 1,400°C.*

The examination of this material has so far been restricted to two series of observations which were made at 1,300 and 1,400°C. in order to stress the difference between it and material " B." The results given in Table 5 and in Figs. 6a and 6b, and in Plates 7 and 8, show that there is a slow conversion to cristobalite but that there is only a negligible formation of clear glass. Figure 7 gives the results obtained in the G.L.C.C. refractoriness test, and it will be seen that whilst there is first a shrinkage due to contraction of the clay, there is afterwards an expansion due to the conversion of the quartz.

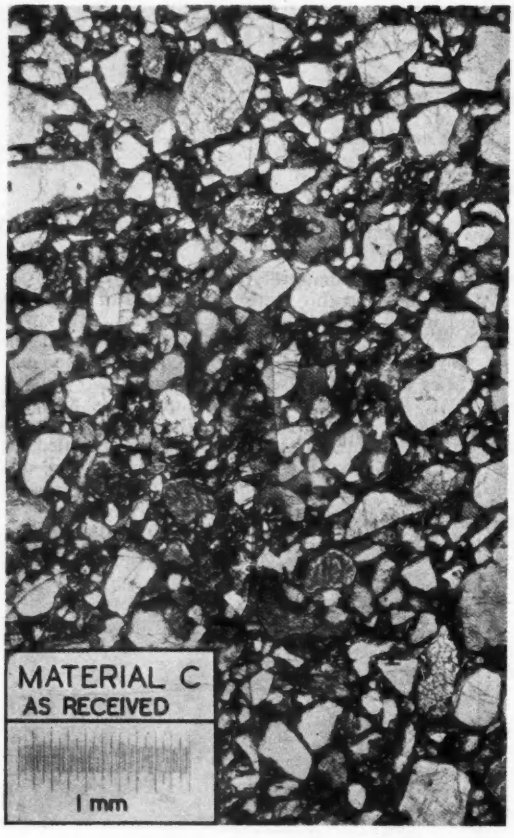


PLATE 7.—*Material "C" as Received*

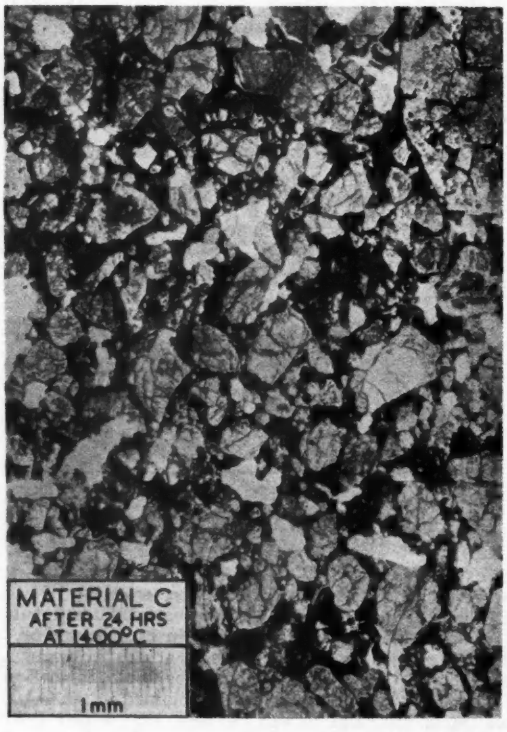


PLATE 8.—*Material "C" after 24 hr. at 1,400°C.*

Plates 7 and 8 show the material as received and after 24 hr. at 1,400°C., respectively. Attention is drawn to the very excellent homogeneity of the material.

Plates 7 and 8 show the material as received and after 24 hr. at 1,400°C., respectively. Attention is drawn to the very excellent homogeneity of the material.

The analysis of material "C" was:—

	%
SiO_2	89·7
Al_2O_3	8·3
Fe_2O_3	0·7
TiO_2	0·8
CaO	0·3
MgO	0·2

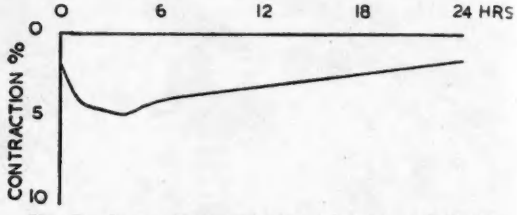


FIG. 7.—*Linear Change of Material "C" at 1,400°C*

TABLE 5.—*Heat Treatment of Material "C"*

Temperature	Duration	Matrix (%)	Quartz (%)	Cristobalite (%)	Glass (%)	Cavities (%)
As received...		48	39	2	0	11
1,300° C. ...	12 hr.	53	35	2	1	9
	1 day	48	34	5	1	12
	2 days	42	31	12	1	14
	4 days	39	26	14	1	20
	8 days	38	24	20	6	12
1,400° C. ...	2 hr.	40	34	8	1	17
	6 hr.	32	35	10	1	22
	12 hr.	39	26	23	1	11
	24 hr.	32	13	32	4	19

Interpretation of Results

Materials "A" and "B," which were of similar physical constitution, behaved very similarly; at first sight it seemed that material "C" behaved differently, but careful consideration of the facts has led us to believe that exactly the same fundamental change took place in this material.

In materials "A" and "B" the quartz very rapidly disappeared, having reacted with the clayey material of the matrix. There was simultaneously the production of a number of cavities. The reaction products at first did not appear greatly different from the matrix and have been classed as such in the analyses of the thin sections: it was obvious, however, that there was a change in some of the clay areas; the texture had altered, but they were still partially opaque and of a brown colour. Further heat treatment led to the production of glass which was frequently transparent and colourless: it occurred in pools in the centre of which there was frequently a cavity. At the same time there was a diminution in the total number of cavities, due probably to the more mobile nature of the glassy matrix leading to agglomeration of the material. The transition from a quartz crystal to glass is illustrated in Plate 9 which is a photomicrograph of a small portion of one of the sections. The crystals are surrounded by an "envelope" of opaque material, presumably clay and reaction products, and outside this there is an area of glass. Further heat treatment favoured the formation of mullite, many large crystals of this being noticed. (Plates 10a and 10b show some good specimens).

In material "C" the disappearance of quartz was less marked, but a considerable amount converted to cristobalite; the volume change involved caused the shattering of the crystals, well shown in Plate 8. Very little glass appeared, and under a low power the matrix did not appear to have changed: reference to the photographs will show that this material is characterized by excellent mixing and uniformity, so that the large areas of clay found in materials "A" and "B" are absent. It would be thought that such intimate contact between clay and quartz would have favoured the solution of quartz, as has been described in the case of the other two materials. Examination of the matrix with a high-power objective disclosed the presence of very small crystals o

mullite in brown glassy areas. It is suggested that the clay-quartz reaction had contributed to this change in the matrix, although it is admitted that the amount of quartz involved must have been small.

It seems from these observations that mullite, with more or less glass, is a final stable product of the interaction of clay and quartz. In materials "A" and "B" clay preponderates and is sufficient to account for most, if not all, of the quartz. In material "C" the amount of clay is less and it is possible that both it and the quartz are less reactive.

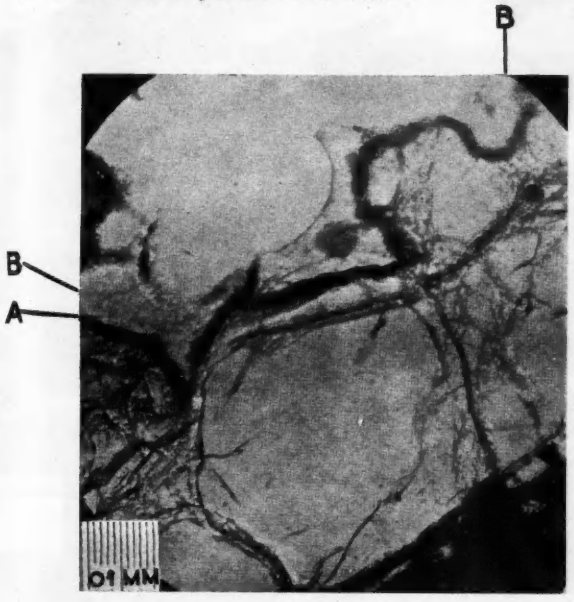
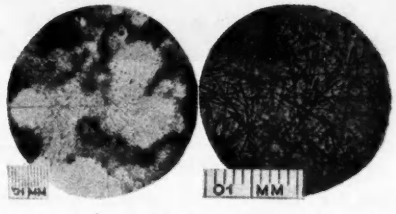


PLATE 9.—*Quartz Crystals with Characteristic Dark Sheath (A) and an Adjacent Area of Clear Glass (B)*

This explanation of the behaviour of "C" is in accord with its excellent record in use. Although commonly spoken of as a clay-bonded silica, it is, after short use, not clay bonded but mullite bonded, and as such may be expected to be inherently stable.



PLATES 10A AND 10B.—*Mullite Crustals formed in Material "A" after Heating for 4 weeks at 1,200°C.*

It is thought likely that the rate of the reaction between clay and quartz may be influenced by the iron content of the clay, but no definite evidence has yet been obtained. Attention is drawn to this because materials "A" and "B" contain much more iron than material "C."

Variation in the Behaviour of Quartz from Different Sources

It is noteworthy that in most clay refractories there is a small residue of quartz apparently unaffected by prolonged heat work. Further, the quartz in refractories prepared from pocket sands exhibits a remarkable resistance to conversion. A large proportion of apparently unchanged quartz has been found in such material after eight years at an average temperature of 1,300°C. Materials prepared from crushed ganister show little or no residual quartz after a few days at this temperature. It is suggested that the explanation lies in the previous history of the quartz concerned.

Clays and sands are both degradation products from igneous rocks, the sand being an unaltered residue and the clay a decomposition product from the weathering of felspars. It is to be presumed, therefore, that the quartz of sand grains originally crystallized from fused silica or was produced by metamorphism at high temperatures. Ganisters, on the other hand, are largely produced by the deposition of silica from aqueous solution, either as a cementing agent, consolidating previously collected sand, or as a solution and recrystallization of sand *in situ*, or as an entirely new silica deposit.*

In the case of the consolidation of sand deposits this is usually effected by the growth of existing quartz crystals to fill the interstitial space. The new silica so accumulated represents about 30 per cent. of the whole and probably modifies the original sand. It is suggested that the characteristic inactivity of sand is due to the igneous or metamorphic origin of the quartz. Possibly a much more resistant crystal surface has resulted than that produced by crystallization from water. This could have the effect of depressing both the rate of conversion and the chemical activity.

The unaffected residual quartz noted in fireclay goods is assumed to be sand particles inherent in the clay and derived from the same original crystalline rocks. The quartz that rapidly disappears is assumed to result from contamination with quartzitic material derived from the adjacent strata in the course of mining. From this argument it follows that clays containing quite high proportions of what may be termed inherent quartz might produce reasonably satisfactory refractory goods.

Conclusions

The behaviour of quartz as a major constituent of a fireclay brick has been studied. It was found that the reaction between quartz and clay leads to the production of glass of low refractoriness and that this change is accompanied by considerable shrinkage. The highly refractory material mullite, $3Al_2O_3$, $2SiO_2$, appeared to be an end product in all the cases investigated, but it did not form in sufficient quantity or with sufficient rapidity to stabilize the structure and prevent the risk of serious distortion. It was also found that the quartz greatly reduced the resistance of the material to thermal shock; it is likely that the vitrified product will have similar properties.

Materials derived from pocket sand (*e.g.*, material "C") appear to be tolerant of up to 20% of clay without serious shrinkage, partly because the contraction of the clay is offset by the expansion of the quartz on conversion to cristobalite; it is possible that the quartz involved has a more resistant nature than that derived from ganister, so that its rate of reaction with clay is approximately balanced by the rate of formation of mullite from the resultant glass, a strong bond being produced immediately the glass is formed.

The Authors wish to acknowledge their indebtedness to the Directors of The Gas Light and Coke Company for permission to publish these results, and to all those of their colleagues who helped in their production, particularly Mr. A. Edwards who first pointed out the undesirable nature of additions of quartz to clay; Mr. C. C. T. Davis, who made most of the thin sections and carried out much of the testing involved; and Mr. W. Lewcock, who helped with advice and analyses.

APPENDIX 1

The method consists in heating a test piece 1 in. × 1 in. × 1 in. under a light load (approx. 1 lb. per sq. in.) and observing the change in its height.

The apparatus required comprises:—

(1) *A high-temperature gas-heated furnace* of the concentric jet type capable of accommodating the table and tubes illustrated in Fig. 8, and of producing a zone of uniform temperature 3 in. deep around the test piece. The control must be sufficiently sensitive to give the prescribed rate of heating and to provide an atmosphere within the furnace having an excess of oxygen.

(2) *Table, tubes, diaphragms and discs* of suitable refractory material, as shown in the accompanying sketch. The bases of the table and of the tubes "A" and

* Geikie, A. Text Book of Geology. U.S. Geological Survey Monographs, 1904, 47. 865.

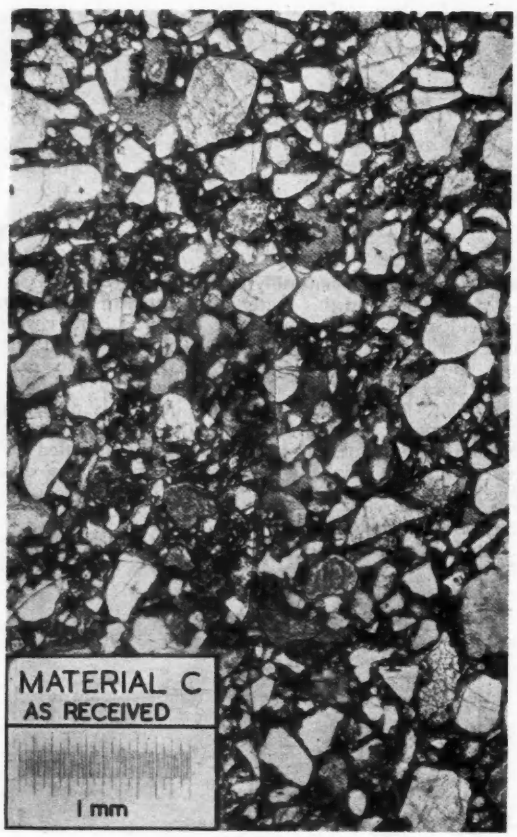


PLATE 7.—*Material "C" as Received*

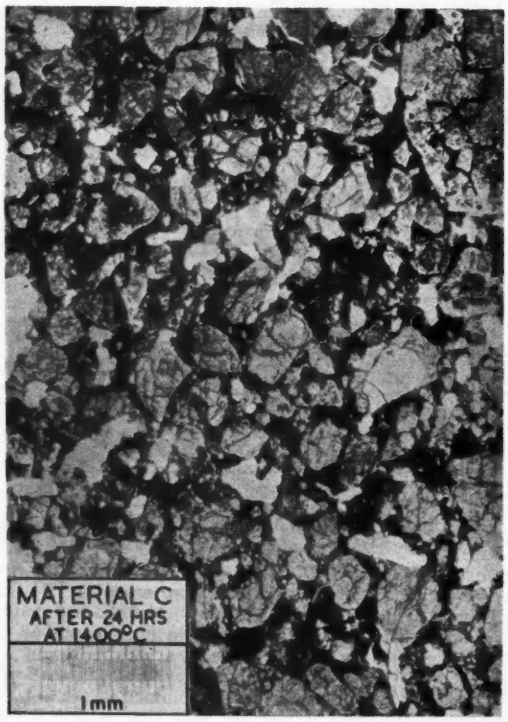


PLATE 8.—*Material "C" after 24 hr. at 1,400°C.*

Plates 7 and 8 show the material as received and after 24 hr. at 1,400°C., respectively. Attention is drawn to the very excellent homogeneity of the material.

Plates 7 and 8 show the material as received and after 24 hr. at 1,400°C., respectively. Attention is drawn to the very excellent homogeneity of the material.

The analysis of material "C" was:—

	%
SiO_2	89·7
Al_2O_3	8·3
Fe_2O_3	0·7
TiO_2	0·8
CaO	0·3
MgO	0·2

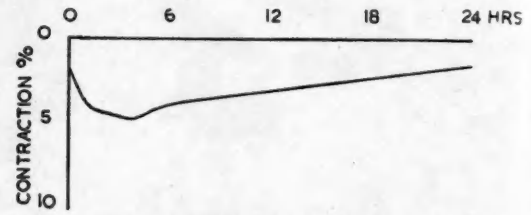


FIG. 7.—*Linear Change of Material "C" at 1,400°C*

TABLE 5.—*Heat Treatment of Material "C"*

Temperature	Duration	Matrix (%)	Quartz (%)	Cristobalite (%)	Glass (%)	Cavities (%)
As received...		48	39	2	0	11
1,300° C. ...	12 hr.	53	35	2	1	9
	1 day	48	34	5	1	12
	2 days	42	31	12	1	14
	4 days	39	26	14	1	20
	8 days	38	24	20	6	12
1,400° C. ...	2 hr.	40	34	8	1	17
	6 hr.	32	35	10	1	22
	12 hr.	39	26	23	1	11
	24 hr.	32	13	32	4	19

Interpretation of Results

Materials "A" and "B," which were of similar physical constitution, behaved very similarly; at first sight it seemed that material "C" behaved differently, but careful consideration of the facts has led us to believe that exactly the same fundamental change took place in this material.

In materials "A" and "B" the quartz very rapidly disappeared, having reacted with the clayey material of the matrix. There was simultaneously the production of a number of cavities. The reaction products at first did not appear greatly different from the matrix and have been classed as such in the analyses of the thin sections: it was obvious, however, that there was a change in some of the clay areas; the texture had altered, but they were still partially opaque and of a brown colour. Further heat treatment led to the production of glass which was frequently transparent and colourless: it occurred in pools in the centre of which there was frequently a cavity. At the same time there was a diminution in the total number of cavities, due probably to the more mobile nature of the glassy matrix leading to agglomeration of the material. The transition from a quartz crystal to glass is illustrated in Plate 9 which is a photomicrograph of a small portion of one of the sections. The crystals are surrounded by an "envelope" of opaque material, presumably clay and reaction products, and outside this there is an area of glass. Further heat treatment favoured the formation of mullite, many large crystals of this being noticed. (Plates 10a and 10b show some good specimens).

In material "C" the disappearance of quartz was less marked, but a considerable amount converted to cristobalite; the volume change involved caused the shattering of the crystals, well shown in Plate 8. Very little glass appeared, and under a low power the matrix did not appear to have changed: reference to the photographs will show that this material is characterized by excellent mixing and uniformity, so that the large areas of clay found in materials "A" and "B" are absent. It would be thought that such intimate contact between clay and quartz would have favoured the solution of quartz, as has been described in the case of the other two materials. Examination of the matrix with a high-power objective disclosed the presence of very small crystals of

mullite in brown glassy areas. It is suggested that the clay-quartz reaction had contributed to this change in the matrix, although it is admitted that the amount of quartz involved must have been small.

It seems from these observations that mullite, with more or less glass, is a final stable product of the interaction of clay and quartz. In materials "A" and "B" clay preponderates and is sufficient to account for most, if not all, of the quartz. In material "C" the amount of clay is less and it is possible that both it and the quartz are less reactive.

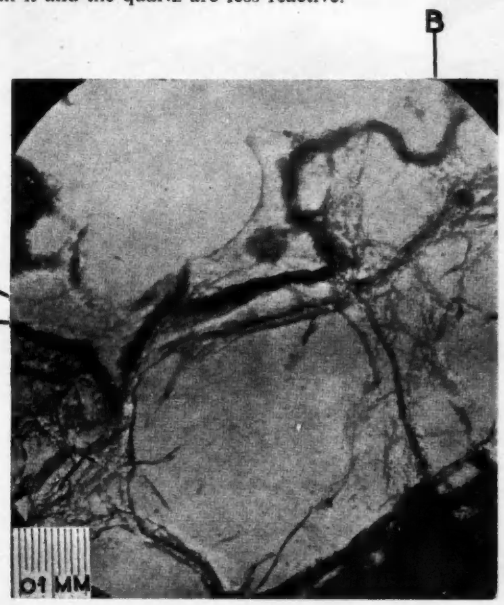
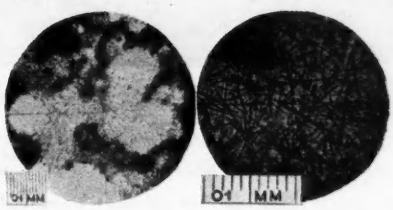


PLATE 9.—*Quartz Crystals with Characteristic Dark Sheath (A) and an Adjacent Area of Clear Glass (B)*

This explanation of the behaviour of "C" is in accord with its excellent record in use. Although commonly spoken of as a clay-bonded silica, it is, after short use, not clay bonded but mullite bonded, and as such may be expected to be inherently stable.



PLATES 10A AND 10B.—*Mullite Crustals formed in Material "A" after Heating for 4 weeks at 1,200°C.*

It is thought likely that the rate of the reaction between clay and quartz may be influenced by the iron content of the clay, but no definite evidence has yet been obtained. Attention is drawn to this because materials "A" and "B" contain much more iron than material "C."

Variation in the Behaviour of Quartz from Different Sources

It is noteworthy that in most clay refractories there is a small residue of quartz apparently unaffected by prolonged heat work. Further, the quartz in refractories prepared from pocket sands exhibits a remarkable resistance to conversion. A large proportion of apparently unchanged quartz has been found in such material after eight years at an average temperature of 1,300°C. Materials prepared from crushed ganister show little or no residual quartz after a few days at this temperature. It is suggested that the explanation lies in the previous history of the quartz concerned.

Clays and sands are both degradation products from igneous rocks, the sand being an unaltered residue and the clay a decomposition product from the weathering of felspars. It is to be presumed, therefore, that the quartz of sand grains originally crystallized from fused silica or was produced by metamorphism at high temperatures. Ganisters, on the other hand, are largely produced by the deposition of silica from aqueous solution, either as a cementing agent, consolidating previously collected sand, or as a solution and recrystallization of sand *in situ*, or as an entirely new silica deposit.*

In the case of the consolidation of sand deposits this is usually effected by the growth of existing quartz crystals to fill the interstitial space. The new silica so accumulated represents about 30 per cent. of the whole and probably modifies the original sand. It is suggested that the characteristic inactivity of sand is due to the igneous or metamorphic origin of the quartz. Possibly a much more resistant crystal surface has resulted than that produced by crystallization from water. This could have the effect of depressing both the rate of conversion and the chemical activity.

The unaffected residual quartz noted in fireclay goods is assumed to be sand particles inherent in the clay and derived from the same original crystalline rocks. The quartz that rapidly disappears is assumed to result from contamination with quartzitic material derived from the adjacent strata in the course of mining. From this argument it follows that clays containing quite high proportions of what may be termed inherent quartz might produce reasonably satisfactory refractory goods.

Conclusions

The behaviour of quartz as a major constituent of a fireclay brick has been studied. It was found that the reaction between quartz and clay leads to the production of glass of low refractoriness and that this change is accompanied by considerable shrinkage. The highly refractory material mullite, $3Al_2O_3$, $2SiO_2$, appeared to be an end product in all the cases investigated, but it did not form in sufficient quantity or with sufficient rapidity to stabilize the structure and prevent the risk of serious distortion. It was also found that the quartz greatly reduced the resistance of the material to thermal shock; it is likely that the vitrified product will have similar properties.

Materials derived from pocket sand (*e.g.*, material "C") appear to be tolerant of up to 20% of clay without serious shrinkage, partly because the contraction of the clay is offset by the expansion of the quartz on conversion to cristobalite; it is possible that the quartz involved has a more resistant nature than that derived from ganister, so that its rate of reaction with clay is approximately balanced by the rate of formation of mullite from the resultant glass, a strong bond being produced immediately the glass is formed.

The Authors wish to acknowledge their indebtedness to the Directors of The Gas Light and Coke Company for permission to publish these results, and to all those of their colleagues who helped in their production, particularly Mr. A. Edwards who first pointed out the undesirable nature of additions of quartz to clay; Mr. C. C. T. Davis, who made most of the thin sections and carried out much of the testing involved; and Mr. W. Lewcock, who helped with advice and analyses.

APPENDIX 1

The method consists in heating a test piece 1 in. × 1 in. × 1 in. under a light load (approx. 1 lb. per sq. in.) and observing the change in its height.

The apparatus required comprises:—

(1) *A high-temperature gas-heated furnace* of the concentric jet type capable of accommodating the table and tubes illustrated in Fig. 8, and of producing a zone of uniform temperature 3 in. deep around the test piece. The control must be sufficiently sensitive to give the prescribed rate of heating and to provide an atmosphere within the furnace having an excess of oxygen.

(2) *Table, tubes, diaphragms and discs* of suitable refractory material, as shown in the accompanying sketch. The bases of the table and of the tubes "A" and

* Geikie, A. Text Book of Geology. U.S. Geological Survey Monographs, 1904, 47. 865.

the NEW

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"B" are ground truly flat and perpendicular to the respective axes. The discs are of uniform thickness and both surfaces are ground truly flat.

(3) *A telescope*, with an eyepiece micrometer.

TEST PIECE

Brick or Shape

A 1 in. cube is cut from the brick or shape without including any original surface and one pair of opposite faces are ground true and parallel. The distance between these faces is measured with a micrometer gauge.

Cement

A cylinder is cast in a mould 1 in. high and 1 in. in diameter, using the minimum amount of water to give a coherent mix. It is air-dried for 24 hr., heated at 100°C. for 1 hr., and at

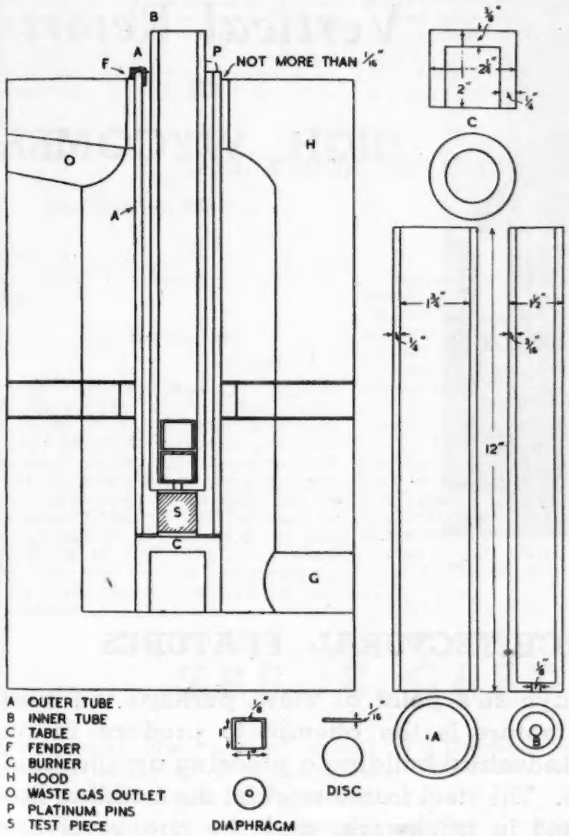


FIG. 8.—*Diagram of Apparatus for Determination of Refractoriness by the G.L.C.C. Method*

1,000°C. for 1 hr. After cooling, the two ends are ground true and parallel, and the distance between them measured with a micrometer gauge.

METHOD

The table is placed in the furnace with the surface level. The test piece, with the ground faces at the top and bottom, is placed on a disc situated centrally on the table. A second disc is placed on top of the test piece. The tube "A" is seated on the table, surrounding the test piece. Two diaphragms are introduced into "B" and their holes aligned with the hole in the base: the tube is then carefully lowered into position so that it rests on the upper disc and is concentric with "A."

Platinum pins, "P," are fixed to the tops of the tubes so that their tips may be sighted simultaneously in the eyepiece of the telescope. Changes in height of the test piece during heating are observed by noting the changes in the relative position of these reference points. The temperature of the test piece is ascertained by sighting an optical pyrometer on the top disc, through the holes in the diaphragm and tube end, and on the base of the table through the annular space between the tubes. The two temperatures should not differ by more than 10°C., the mean of the two being recorded.

The furnace is heated at the rate of 20°C. per min. until a temperature of 1,000°C. is reached, and thereafter at 4°C. per min. to the required temperature, which is held constant for the required time. Records of temperature and of the differential position of the reference points are made every 5 min. Finally the test piece is allowed to cool to atmospheric temperature, removed from the furnace, and the distance between the ground faces again measured by micrometer. Any change noted should agree with the total change in the relative position of the reference points, unless the collapse be of such nature as to preclude any such agreement.

APPENDIX 2

Nothing is equal to the visual examination of thin sections, but in order to give some idea of their appearance composite photomicrographs have been included in this Paper. The field of a microscope is not sufficiently large to enable the general texture of a section to be depicted in one photograph: in order to get over this difficulty several overlapping photographs have been taken and mounted so as to give a composite picture. Plates 1, 2, and 5 to 8 are simply reproductions of these.

In these photographs quartz and cavities both appear white, but the quartz may frequently be recognized by its shape or by cleavage lines across the crystals. Clay appears grey or black, having frequently a woolly texture.

Glass is easily recognized. A good example is in Plate 6, where there is a large area of glass and several crops of large needle crystals of mullite.

In using a microscope, quartz is most easily recognized by its bi-refringence when viewed between crossed nicols. This property is used in Plates 4a to 4e, which consist of groups of three photographs, one in ordinary light and two in polarized light with crossed nicols: the second of these was taken with the specimen rotated through 45° of arc from the first in order to show up any particles of quartz which may have been in the position of extinction in the first photograph.

A scale has been superimposed on most of the photographs so that the actual magnification in any reproduction can be readily calculated.

Foresight Rewarded

Complimentary references to the work of Mr. Alex. Jamieson, Engineer and Manager, and his staff were made recently when members of the Johnstone Town Council paid a visit of inspection to the undertaking. They were shown over the works by Mr. Jamieson and afterwards entertained to tea, Provost Briggs presiding.

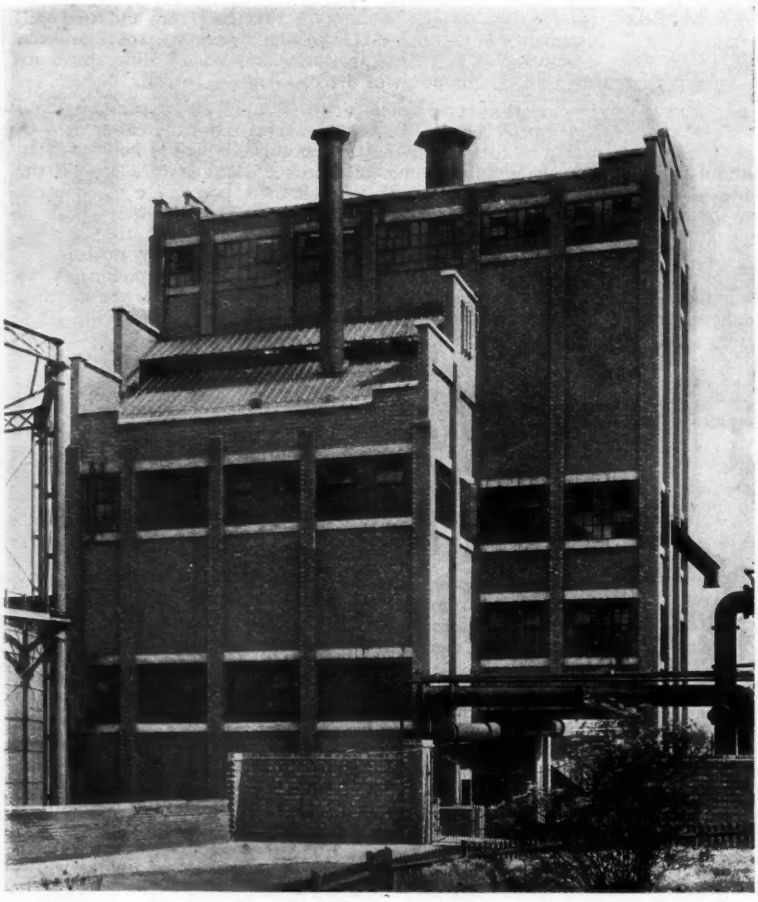
Bailie Woodhouse, Convenor of the Gas Committee, said the developments and efficiency of the service reflected great credit on Mr. Jamieson and his endeavour to have the gas-works ever to the forefront amongst gas undertakings.

Mr. Jamieson's enterprise and initiative was also commented upon by Bailie Blackwood, Housing Convener, who said he could always be depended upon for development schemes, and was always well ahead in arranging for the delivery of material.

Ex-Bailie Milligan said the marked advance that had been made spoke of a splendid progressive spirit. The importance of the undertaking was not confined to Johnstone, as was evident by the fact that they were supplying other areas with gas, and that was something which was likely to be developed on a considerable scale in the near future.

Replying, Mr. Jamieson said that the gas workers greatly appreciated a visit by members and officials of the Council. They had attained a record figure for daily, weekly, and monthly production at the works in December. He paid tribute to the able assistance of Mr. Scott, Assistant Manager, and Mr. Miller, Works Mechanic.

That Mr. Jamieson had saved the burgh many thousands of pounds by his foresight in installing plant at the time he did, was stated by Mr. G. Chapman, representative of the Vulcan Boiler Insurance Co. Other Corporations now considering similar schemes would find conditions more difficult, and have to face outlay on a much heavier scale.



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ARCHITECTURAL FEATURES

From the layman's point of view, perhaps the most interesting feature is the attempt to produce in an essentially industrial building a pleasing architectural appearance. The steel frame-work of the building has been encased in brickwork, and the coal-receiving annexe and coke hoppers are built as integral features of the main building. A liberal use has been made of steel-framed windows for producing maximum natural lighting and ventilation. Parapets with "Snowcrete" coping form a pleasing finish to the skyline. Rain-water pipes are not visible, being taken down internally. The full effect of the building when viewed from Desborough Road is masked to some extent by the abutment of the old horizontal retort house, but when this is dismantled and the new retort house extended it will appear as an independent and symmetrically designed structure.

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Publications Received

The question of water supply has dictated the siting of towns and villages and has moved nations and swayed governments; perhaps no one problem has played so vital a part in man's history. *The Story of Water Supply* from the earliest times to the present is told in a new book by F. W. Robins, who combines a store of historical information with a lucid and readable style. Illustrated by many photographs and equipped with an exhaustive index, the book is published by Geoffrey Cumberlege, Oxford University Press, price 18s. net.

* * *

We have received many interesting records of individual firm's contributions towards the war effort. Most recent of these is the book *Ford at War*, issued by the Ford Motor Co., Ltd. This lavish production consists of over 90 pages, many of which are full-page colour drawings and photographic sections. Written by Hilary St. George Saunders, who was responsible for "Battle of Britain" and "Bomber Command," the book tells the story of the harnessing of the famous Dagenham factory to the needs of the country in the face of considerable enemy interference. It describes the many forms of vehicle which took part in the war; one of the most important tasks undertaken by the Ford Co. was the production of Merlin aero engines at a shadow factory at Manchester. It is impossible to give even the most condensed account of these activities in these columns, but a glance at the production figures will give some indication of the magnitude of the task performed. By the spring of 1945 a total of 184,579 four-wheel and 137,483 two-wheel drive vehicles, 262,000 V-8 engines, and 30,000 Merlin XX engines were manufactured—and this in addition to a very high number of engines reconditioned. The story is exciting, human, and more than impressive.

Gas Products Prices

The London Market

Jan. 11.

There are no changes to report in the prices of Coal Tar products for the home market.

The Provinces

Jan. 14.

Average prices for gas-works products: Pitch, 75s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6¾d. per gall.; pure, 3s. 2¼d. Prices for carbolic acid 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil are controlled by Government Orders. Prices for road tar were increased by a half-penny per gall. by S. R. & O. 1945, 229, under which Order there was also an increase of 5s. per ton in the price for standard creosote-pitch mixture.

Scotland

Jan. 11.

Enquiries are numerous and supplies are scarce.

*Refined Tar.** Yield to the distiller is 5d. per gall. ex works, naked. *Creosote Oil.* Timber preserving quality* 5½d. to 6½d. per gall.; Hydrogenation Oil* 5⅝d. per gall.; Low Gravity or Virgin Oil† 7¼d. to 7½d. per gall.; Benzol Absorbing Oil 6½d. to 8d. per gall. *Refined Cresylic Acid* is 3s. 6d. to 4s. 6d. per gall. ex works, naked, according to quality. *Crude Naphtha*† 7d. to 8d. per gall. *Solvent Naphtha.** Basic maximum prices delivered in bulk 90/160 grade, 2s. 10d. per gall. and 90/190 Heavy Naphtha, Unrectified, 2s. 0½d. per gall.; Rectified, 2s. 4d. per gall. *Pyridine*† 90/160 grade 15s. per gall., and 90/140 grade 17s. per gall.

* Price controlled. † Controlled.

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